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United States
Department of
Agriculture

Forest Service

**Pacific
Northwest
Region**

R6-NR-TP-10-96

RIPARIAN ECOLOGICAL TYPES

Gifford Pinchot and Mt. Hood National Forests
Columbia River Gorge National Scenic Area

Alnus rubra
Red Alder

United States
Department of
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RIPARIAN ECOLOGICAL TYPES

Gifford Pinchot and Mt. Hood National Forests
Columbia River Gorge National Scenic Area

By

Nancy M. Diaz, Area Ecologist
T. Kim Mellen, Area Wildlife Ecologist

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240 W Prospect Rd
Fort Collins CO 80526

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INTRODUCTION

In landscape ecology terms, riparian areas are zones of interaction between surface water and the surrounding uplands or hillslopes. Like the chicken and the egg, the kind, frequency and intensity of interactions that occur are both *result* and *causative agent* of the character of riparian landforms, soils and vegetation. In other words, riparian areas *reflect* a variety of processes occurring upslope and instream, and they also *create* conditions that buffer, mitigate and shape those same processes. Furthermore, water runs downhill. As a result, not only do riparian areas integrate stream/hillslope processes in general, but downstream riparian areas integrate what is happening upstream. For these reasons, to truly understand the role of riparian areas, it is necessary to look at the landscape as a *system* of various structural elements (different riparian landform, soil and vegetation types) each having both an individual and a collective contribution to overall system function. Clearly, a first step in comprehending the system is to catalog and describe the individual riparian components, and to make some interpretation regarding the role they play in hillslope/stream interactions. The purpose of this publication is to provide such a vehicle for understanding riparian ecosystems within the Gifford Pinchot and Mt. Hood National Forests and the Columbia River Gorge National Scenic Area.

On a landscape scale, there are certain functions that are unique to riparian areas. These functions often have a directional nature, usually "downslope" (or downstream), but sometimes "upslope" as well. A key "downslope" landscape-scale function of riparian areas is the mediation of movement of materials from the upland into the stream. The soils and vegetation within the riparian zone have significant control over the rate, timing and amounts of water, nutrients, organic debris (for example, large wood) and inorganic (sediments, rock) materials that enter the aquatic ecosystem from the hillslope and from the riparian zone itself. This relocation of water, nutrients, debris and sediments from the terrestrial to the aquatic ecosystem has significant effects on the overall distribution of habitats for fish and other aquatic organisms. The character of the riparian zone also influences the timing, duration and intensity of high flows, which further affects the spatial arrangement of aquatic habitats, and the likelihood of channel de-stabilization, bed scour and bank erosion. Cold air drainage is another "downslope"-oriented riparian feature. The cool, moist environments of riparian zones often introduce an element of diversity into the landscape by providing habitats for a very different community of organisms than is found on the adjacent hillslope. The cool temperatures and high humidity in riparian areas also lessen the susceptibility of riparian areas to high intensity fires.

The primary "upslope"-oriented function of riparian areas is mitigation of the effects of high flow events on hillslopes and stabilized portions of floodplains. Riparian vegetation in particular can have a significant buffering and stabilizing function during floods.

A riparian function with both "downslope" and "upslope" dimensions is that of providing corridors for wildlife travel, especially in highly disturbed (roaded, fragmented or burned) forest landscapes. Riparian areas often provide habitat connections (cover, moisture and food) through landscapes in which desirable habitat elements have declined due to disturbances of various kinds.

Not all riparian areas are created equal; not all riparian sites have the same potential. The ways in which a given riparian site participates in the functions listed above varies according to its particular plant community composition and structure, substrate, landform configuration, climate, frequency and intensity of inundation by the adjacent stream, and context within the landscape. The intent of this publication is to document current knowledge and interpretations of these factors among riparian sites within the study area.

OBJECTIVES

Under the authority of the National Environmental Policy Act of 1969 and the National Forest Management Act of 1976, the USDA Forest Service has undertaken a nation-wide effort to "develop an ecologically-based information system to aid in evaluating land capability, interpreting ecological relationships and improving multiple-use management" (FSM 2060.2), through the vehicle of ecosystem classification (FSM 2061). Ecological classifications integrate potential natural vegetation, soils, landscape features, water and climate, and address issues such as structure, vegetation community composition, productivity, types and effects of disturbances, and habitat relationships.

Ecological classifications are integral to Ecosystem Management. They provide a framework of interpretations from which ranges of natural conditions at a variety of scales can be understood, and from which desired future conditions can be articulated. They provide essential information for predicting the outcomes of various management strategies.

This guide presents an ecological classification of streamside riparian sites within the study area. The information contained herein is intended to allow users to identify the potential natural vegetation communities (see pp. 3-4 for a discussion of this concept) on various fluvial landforms within different valley types and climatic zones, as well as to understand the processes and functions inherent in the various classification units. Suggestions are provided that are intended to aid decision-making about site rehabilitation after a disturbance, and about management of riparian vegetation for large wood, shade, slope stabilization, etc. The classification units themselves provide a framework for characterizing stream systems as a whole, i.e., through analysis of the type, number and spatial arrangement of classification units present in various reaches. The classification system also provides a way of assessing equivalency of potential among various sites that may be in different stages of succession.

FOREST	DISTRICT	STREAM
Gifford Pinchot	St. Helens	Fossil Cr.
		Kalama R.
		Pin Cr.
	Mt. Adams	Lost Cr.
		Trout Lake Cr.
	Packwood	Cortwright Cr.
		Smith Cr.
		Willame Cr.
	Randle	Quartz Cr.
		Woods Cr.
		Yellowjacket Cr.
	Wind R.	E. Fk. Lewis R.
		Trapper Cr.
		Trout Cr.
		Wind R.
Mt. Hood	Barlow	Threemile Cr.
		Little Badger Cr.
		S. Fk. Mill Cr.
	Bear Springs	Clear Cr.
		Stone Cr.
	Clackamas	Fawn Cr.
		Lowe Cr.
		N. Fk. Clackamas R.
		Shellrock Cr.
	Col. Gorge	Clear Cr.
		Little Sandy R.
	Hood R.	Cabin Cr.
		Gate Cr.
		Pinnacle Cr.
	Zigzag	Cheney Cr.
		Clear Cr.
		Eagle Cr.
		Mack Hall Cr.
		Salmon R.
		Sandy R.
		S. Fk. Salmon R.
		Zigzag R.
Columbia Gorge Nat. Scenic Area	Cabin Cr.	
		Multnomah Cr.

Table 1. Streams surveyed for this classification.

METHODS

Sample Design

The data from which this classification is derived were collected over two field seasons in conjunction with the region-wide Riparian Inventory conducted by the Pacific Northwest Region's Fisheries Program. Since the major intent of the Riparian Inventory was to characterize fish habitat, virtually all of the sampling occurred in fish-bearing streams, which biased the sample towards larger, perennial streams. This bias was not significantly problematic to our objective of characterizing riparian ecological types, because the streamside zones of most smaller perennial and intermittent streams have vegetation characteristic of upland forests which have already been covered by ecological classifications (Hemstrom and others, 1982; Brockway and others, 1983; Halverson and others, 1986; Topik and others, 1986; Topik and others, 1988; Topik and others, 1989).

A subset of the streams surveyed by the Riparian Inventory crews was selected for Riparian Ecology Plot sampling. The streams were selected to represent the range of conditions that exist within the Gifford Pinchot and Mt. Hood National Forests and the Columbia River Gorge National Scenic Area, in terms of environment, watershed conditions and geographic distribution. Table 1 lists the streams in which Riparian Ecology Plots were located. Within selected stream reaches, Riparian Ecology Plots were placed to coincide with the Riparian Inventory "measured units", a system of randomly-located aquatic habitat units (riffles, pools, etc.).

Plot Methods

Within the boundaries of each "measured unit", the 3 or 4 most "typical" fluvial landforms that occurred within the active floodplain were identified. "Active floodplain" was considered to be that area which originated from fluvial action of the stream, and its outer boundaries roughly coincide with the outside of the "floodprone" or "100-year floodplain" zone. Environmental, geomorphic, substrate and vegetation data were collected both for the general riparian area adjacent to the habitat feature as a whole, and for individual landforms. On forested landforms, a 500 m^2 circular plot was used. For shrubby or herbaceous communities, a rectangular 5x10 meter plot size was employed. Appendix A lists the data collected from Riparian Ecology Plots.

Classification Methods and Concepts

Classification units were derived from an iterative analysis and interpretation process, primarily involving numerical classification techniques (e.g., TWINSPAN; Gausch, 1979), qualitative examination of association tables, and stepwise discriminant analysis. Indicator plant species, plant community structure, fluvial landforms, substrate, and relation to the normal high-water line were the primary factors considered in differentiating among classification units.

Determining the successional status of plant communities proved to be a challenge because of the highly dynamic nature of riparian environments. Some communities appeared to represent the potential natural vegetation where they were found, given the frequency and intensity of high flows. Other communities appeared to represent the potential in some sites, and be successional in other situations. For the purposes of this guide, the following definitions will be used:

Plant community - An assemblage of plant species that recurs across the landscape. Its successional

status may vary depending on the situation (for example, it may represent the potential natural community in a site that is flooded every few decades, but be successional to a different community in sites with a longer flood return interval).

Potential natural community or **vegetation** - The plant community that reflects the "endpoint" of successional processes. The community that remains relatively stable in terms of composition and structure because it is in relative equilibrium with the environmental factors and processes characteristic of the site. Many riparian areas are frequently disturbed (even seasonally in some cases) and reach their PNC in a short time. Less-frequently disturbed sites may take decades or centuries to express the PNC, and go through a number of intervening successional stages along the way.

Plant association - A plant community that represents the potential natural vegetation of a site; synonymous with "potential natural community".

Ecotype (or **ecological type**) - A classification unit that reflects the PNC along with its characteristic abiotic (soil, landform, geology) attributes. Often a PNC will occur in more than one ecotype, because of compensating factors among abiotic elements.

In this guide, a classification unit is labeled a "Plant Association" only when it is assumed to reflect the potential natural community given the frequency and intensity of flooding characteristic of the sites where it is found. The flood return interval may be short or long, but the vegetation and landforms appear to be in equilibrium with the hydrologic regime. "Ecotypes" are described only for Plant Associations, because by definition they reflect the integration of the potential natural vegetation with the abiotic environment. The term "Plant Community" is used either where the community is felt to be successional to a different type, or where it appears to be successional in some sites and to reflect the PNC in others.

THE PHYSICAL ENVIRONMENT

Fluvial action, high water tables, cold air accumulation and topographic shading are the key non-biotic features of riparian zones in mountainous terrain. Together these factors create a mosaic of environments that differ significantly from the adjacent upland, and result in a fine-grained diversity of structures and communities within the riparian zone.

Fluvial action - the frequency, intensity and duration of high flows - renders riparian areas the most dynamic of any landscape element in the study area. Of any of the abiotic factors, it probably contributes the most to the pattern and longevity of vegetation communities and riparian landforms that occur. It is expressed at a variety of scales: in the substrates present, in the distribution of geomorphic surfaces that are found, and in the overall morphology of the valley floor. In this study we characterized all three scales of expression of fluvial activity, and used them to help explain the distribution of vegetation communities that were found and to interpret flooding regimes. Table 2 summarizes the relationships between riparian plant communities and physical environments found within the study area.

Substrates

Some generalizations can be made about riparian substrates (the term "soils" is avoided, because it implies a degree of soil development through time that is often not present in riparian areas). Finer substrates (clays, silts, sands) generally indicate lower energy environments than coarser substrates (cobbles, boulders). Gentle

CONIFER FOREST TYPES	SUBSTRATES	LANDFORMS	VALLEY TYPE	ROS-GEN
ABGR-THPL/LYAM	Silt/sand; high organic material; wet	Floodplain wetlands	Alluv. mt. valleys	C
THPL/ATFI-STCO4	Silt/sand (over cobbles); moist	Banks, inact. channels	Incis. & alluv. valleys	B, C
THPL/RUSP/OXALIS	Silt/sand (over cobbles)	Terraces, streambanks	Alluv. mt. valleys	B, C
HARDWOOD FOREST TYPES				
ALRU/ACCI	Silt/sand (over cobbles); dry	Terraces, streambanks	Incised (alluv.) valleys	A, B
ALRU/ELGL	Gravel, cobbles; dry	Terraces, streambanks	Wide alluv. valleys	C
ALRU/OPHO	Silt/sand (over cobbles); wet	Terraces, streambanks	Incised to slope-bound	C
ALRU/OXALIS	Silt/sand (over cobbles)	Terraces	Wide alluv. valleys	C
ALRU/PEFR2	Coarse; moist root zone	Terrace, depos. bar	Alluv. mt. valleys	B, C
ALRU/RUPA	Sand/silt over cobbles	Terraces, streambanks	Incis. & alluv. valleys	B, C
ALRU/RUSP/OXALIS	Sand/silt (gravel)	Terraces	Alluv. & incised valleys	B, C
ALRU/RUSP/TOME	Variable; moist	Terraces, streambanks	Alluv. & incised valleys	B, C
ALRU/STCO4	Sand over cobbles; moist	Terraces, streambanks	Incised, mod. gradient	B, C
ALRU/TOME-MOSI	Sand over cobbles	Terraces	Alluv. mt. valleys	C
POTR2	Gravels, cobbles; moist root zone	Island, terrace	Wide alluv. valley	C
SHRUB TYPES				
ACCI	Sand/gravel/cobble mix; dry	Terraces	Incised, mod. gradient	A
ACCI-ALIN	Sand over cobbles	Inside bends	Incised, mod. gradient	B
ACCI-STCO4	Silt/sand (over cobbles)	Streambanks	Incised	A, B
ALIN-VAOV	Silt/sand over cobbles	Terraces, streambanks	Slope-bound, mod. grad.	B, C
ALRU (Shrub)	Cobbles; dry surface, moist root zone	Islands, streambanks	Alluv. valleys	C
ALRU (Shrub)/TRCA3	Silt/sand (over cobbles); moist	Streambanks, terraces	Slope-bound, mod. grad	B, C
ALSI	Silt/sand; moist	Banks, bars, terraces	Incised valleys	A, B
COST	Silt/sand (over cobbles)	Streambanks, terraces	Alluv. mt. valleys	C
OPHO	Silt/sand (over cob.); organ. mat; wet	Streambanks, terraces	Variable	All
RIBR-RUSP/OXALIS	Silt/sand	Streambanks, terraces	Alluv. or incised valleys	A, C
RIBR-RUSP/PEFR2	Silt/sand (over cobbles); moist root z.	Banks, terraces, bars	Variable	All

Table 2. Summary of physical environments for riparian types. Summarizes most common features only; for complete discussion of physical environments of types, see individual type descriptions.

RIBR-RUSP/TOME	Sand or cobbles	Terraces, islands	Alluv. or incised valleys	B, C
SASI2	Variable; coarse; dry surf., wet root z.	Streambanks	Alluv. valleys	B, C
SASI2/PEFR2	Coarse; dry surface, wet root zone	Terraces, bars	Incised or alluv. valleys	A, B
VAAL-VAOV	Silt/sand (over cobbles)	Terraces	Alluviated valleys	C (B)
HERBACEOUS TYPES	**SUBSTRATES**	**LANDFORMS**	**VALLEY TYPE**	**ROS-GEN**
ADPE	Rock or cobbles; wet	Steep cliffs, streambanks	Variable	All
CALE5	Silt/sand; high organ. mat.; wet	Wetlands, banks	Alluv. valleys	B, C
COAQ	Gravels; flowing water	Bars, streambanks	Alluv. valleys	B, C
EQAR	Variable; dry surface, wet root zone	Banks, islands	Variable	All
HYPE	Sand, gravel; dry	Bars	Variable	All
LYAM	Silt/sand; mucks; high OM; wet	Wetlands, terraces	Alluv. & glacial valleys	B, C
MIGU	Gravels, cobbles; wet	Islands, bars, lower banks	Alluv. valleys	B, C
OXALIS	Silt/sand	Streambanks, terraces	Incised or alluv. valleys	A, B
PEFR2	Cobbles, gravels; moist root zone	Depositional bars	Variable	All
SAAR4-SETR	Silt/sand (over cobbles)	Depo. bars, streambanks	Incised or alluv. valleys	A, B
SCMI	Silt/sand; high organ. mat.; wet	Wetlands, streambanks	Variable	All
SETR-ASMO	Variable	Terraces, streambanks	Alluviated valleys	B, C
STCO4-ATFI	Gravels, cobbles; moist	Streambanks, terraces	Variable	All
STCO4-MIGU	Cobbles, gravels; wet	Depo. bars, terraces	Alluviated valleys	C (A)

Table 2 - Summary of physical environments for riparian types - cont'd.

high flows that deposit finer materials may occur without changing the composition of the existing plant community (although some individual plants may be destroyed). Cobble or gravel deposits indicate a greater intensity of flow (due to greater capacity of the larger volume of swift-moving water to carry a bedload). The residence time of high flows also affects the distribution of substrates; for example, the longer a surface is inundated by low energy floodwaters, the finer the sediments that remain.

The presence of organic material, especially if well-decomposed and incorporated into the mineral soil, suggests at least several years to decades since the most recent high flow event (not including gentle inundation). Muck or peat soils generally indicate year-round saturation from groundwater, but little fluvial action. Lack of organic matter and soil profile development usually is indicative of recent deposition or very dry conditions.

The degree of substrate layering can be diagnostic of fluvial activity. Unsorted deposits often indicate high intensity flows that recede quickly - a "flashy" flow regime. Several distinct textural layers indicate a series

of high flow events, the intensity of which can be interpreted from the particle size. Very frequently we encountered substrates that had a layer of sand 5 to 20 cm. thick over cobbles. Often these could be interpreted as sites that received high intensity flows with cobble deposition in the last few decades (for example, during the big storms of 1964 or the 1970s), with subsequent lower intensity flows that deposited sands and silts. In many cases it seemed that plant community establishment did not occur until after the finer materials had been deposited. Extensive roading in watersheds likely has increased the supply of finer sediments, which may be a contributing factor in depositions subsequent to the high flows of two to three decades ago.

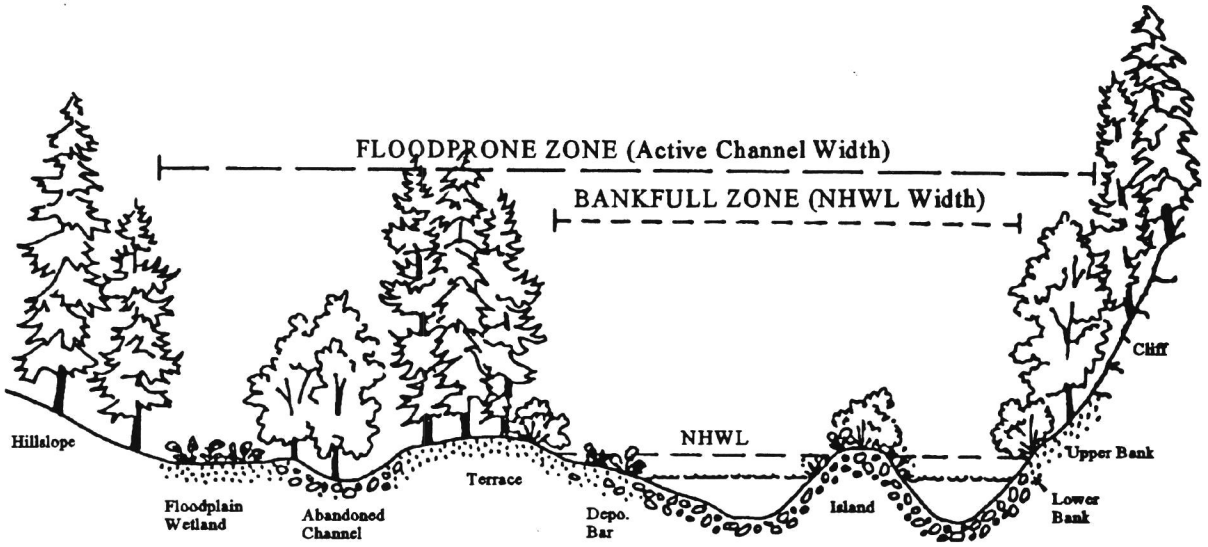
Substrate texture and moisture are key factors in the distribution of plant communities observed in the study area. Finer-textured substrates with adequate moisture tend to have the most diverse and well-developed vegetation, and they tend to revegetate more quickly after ground disturbance. There are fewer species adapted to cobble-dominated substrates (red alder (ALRU), black cottonwood (POTR2), Sitka willow (SASI2), common horsetail (EQAR) and coltsfoot (PEFR2) are the most prominent within the study area). Plant invasion after a disturbance may actually be quite rapid (especially with red alder), but the ensuing plant community is often less dense and rich in species than on finer-textured substrates.

Landforms

Fluvial landforms are geomorphic features created by stream action. They can be erosional (for example, where the stream is cutting into the hillslope), depositional (such as in-channel gravel bars) or both (eroding streambanks where the stream is cutting through an older terrace). Figs. 1 and 2 illustrate the landform categories that were used in this study. A key aspect of the riparian ecosystem is the differentiation between the bankfull and floodprone zones, the interface of which is the **normal high-water line** (NWHL). The **bankfull zone** is that portion of the riparian landscape that is inundated on more or less a seasonal basis (flood return interval = 1.5 years). The type of vegetation that occurs in the bankfull zone is highly influenced by the intensity of normal seasonal high flows. Usually woody vegetation is precluded; exceptions are species like red alder, black cottonwood and willows which may survive low to moderate intensity inundation for relatively short intervals. Thus, vegetation can be a good indicator of the normal high-water line. The **floodprone zone** is that portion of the landscape that is within the 100-year floodplain, but above the bankfull zone. Depending on valley morphology, it may be flooded every few years, to several decades, to a century or more. The extent and character of the bankfull and floodprone zones varies according to the valley type (see below). In entrenched valleys, the bankfull and floodprone zones may almost be synonymous.

Terraces are older depositional floodplain surfaces that, because of renewed downcutting by the stream, are now raised above the normal high-water line. Within terraces, **abandoned stream channels** or **floodplain wetlands** may be present. Usually these features have finer-textured substrates, at least at the surface, and are relatively stable. Streambanks are the topographic features that confine the stream itself. **Lower streambanks** are defined as that portion of the bank below the normal high-water line in the bankfull zone, that is, the seasonally-flooded portion. **Upper streambanks** are above the normal high-water line, in the floodprone zone. **Cutbanks** and **inside bends** (point bars) are special categories of streambanks and often occur directly across from each other where the stream bends. Cutbanks are actively eroding, usually relatively steep, streambanks that have the energy of the stream directed towards or along them; inside bends (point bars) are often flatter, depositional banks with the stream flow directed away from them. Streambanks vary in their steepness and stability, and can be a significant source of sediments for downstream areas. **Depositional bars** (medial bars) and **islands** are in-channel features, usually the result of deposition of

Fig. 1. Fluvial landforms - Alluviated valley types. (NHWL = Normal high-water line)



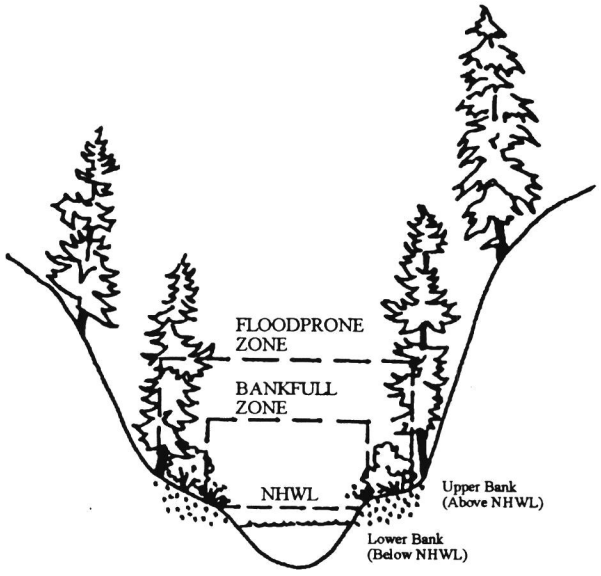


Fig. 2. Fluvial landforms - Incised valley types. (NHWL = Normal high-water line)

coarse sediments during high-intensity flow events. They are among the most dynamic of all the fluvial landforms, and are often significantly reconfigured during floods. And finally, steep **rock cliffs** often occur in incised reaches; they tend to be harsh sites for plant growth, but are relatively stable.

Valley types

In this study, classification of stream reaches into valley type segments depended on three factors: stream gradient, amount of floodplain development/degree of entrenchment, and position of the reach within the overall drainage. Valley type is a significant feature of the riparian ecosystem, because the morphology of the channel, by controlling the frequency, intensity and duration of inundation of the riparian area, strongly influences the fluvial landforms and substrates present, and the structure and composition of riparian vegetation.

Incised steep gradient and **incised moderate gradient** valley segments are hill-slope constrained with minimal development of floodplain features (bars, terraces). Often these stream reaches have a narrow riparian zone, and upland forest vegetation comes very close to the normal high-water line, providing a significant source of large wood for the aquatic system. Often there is little seasonal fluctuation in flow. Incised or entrenched valley segments are normally features of mid- to upper portions of stream drainages. They correspond to Rosgen channel types (Rosgen, 1994) A and sometimes B. They are primarily erosional (erosion of debris and sediments exceeds deposition) or transport (debris and sediments are "moving through" efficiently, with little erosion or deposition.

Lower alluviated valleys (in the lower reaches of stream drainages) and **alluviated mountain valleys** (usually mid-drainage) are reaches of significant fluvial activity. The stream may be unconstrained or constrained on only one side by the adjacent hillslope, and is relatively free to "wander" the width of the floodplain during high flows. These are reaches of both erosion and deposition, with many alluvial features - terraces, bars, abandoned channels, islands, etc. There is often considerable seasonal fluctuation in flow, and the riparian zone is relatively wide. Vegetation in alluviated valleys is often diverse and patchy, with a variety of conifer, hardwood, shrub and herbaceous communities, depending on the substrates present and the frequency and intensity of inundation. Rosgen channel types C and some B's fit within these valley segment types.

Intermediate between incised and alluviated valley segments are **moderate slope-bound valleys**. Neither hillslopes nor stream gradient are as steep as in entrenched streams, nor is there as much floodplain development as in alluviated reaches. Many of these segments are classified as Rosgen channel type B. **Headwall tributaries** occur in the upper portions of stream drainages in the study area. These tend to be smaller streams with little floodplain development and seasonal fluctuation in flow. If the valley has not been glaciated, these streams are usually deeply entrenched and narrow, with little to no floodplain features. The conifer forest tends to come down to the water's edge. Many headwall tributaries are in glaciated valleys. These streams are generally narrow, but not as deeply entrenched as in non-glaciated areas. Often there are areas of high water table. The hillslopes tend to be flatter, and have both conifer-dominated forests, and shrub or herb-dominated wetlands.

RIPARIAN VEGETATION

Table 3 summarizes some of the characteristics of riparian plant communities described in this study. Forty-three separate types were derived from the data collected, based on community composition and

CONIFER FOREST TYPES	Mat. Trees Ave. Cov.	Mat. Trees % Cons	Reg. Trees Ave. Cov.	Reg. Trees % Cons	T. Shrubs Ave. Cov.	T. Shrubs % Cons	L. Shrubs Ave. Cov.	L. Shrubs % Cons	Forbs Ave. Cov.	Forbs % Cons.	Grasses Ave. Cov.	Grasses % Cons
ABGR-THPL/LYAM	38	86	30	100	8	29	4	86	57	100	13	100
THPL/ATFI-STCO4	48	85	11	92	19	46	11	92	48	100	10	69
THPL/RUSP/OXALIS	55	100	5	50	29	100	11	90	62	100	2	40
HARDWOOD FOREST TYPES												
ALRU/ACCI	46	100	4	50	50	100	14	92	25	100	8	83
ALRU/ELGL	60	93	22	87	8	60	8	93	20	100	43	100
ALRU/OPHO	50	100	2	75	51	100	21	75	43	100	3	67
ALRU/OXALIS	65	93	7	57	8	79	11	57	71	100	7	79
ALRU/PEFR2	53	67	23	74	17	70	6	81	50	100	9	96
ALRU/RUPA	58	100	15	89	28	89	29	100	37	100	9	78
ALRU/RUSP/OXAL.	51	86	15	75	38	92	17	86	49	100	4	86
ALRU/RUSP/TOME	46	93	10	43	45	100	19	90	38	100	4	70
ALRU/STCO4	65	67	18	78	6	89	11	67	40	100	8	100
ALRU/TOME-MOSI	75	100	12	71	7	57	9	93	61	100	10	93
POTR2	23	67	57	67	13	67			3	100	2	100
SHRUB TYPES												
ACCI			15	75	56	100	21	100	7	100	1	50
ACCI-ALIN	31	80	12	80	64	100	17	100	19	100	6	100
ACCI-STCO4	13	27	8	55	64	100	12	64	43	100	2	82
ALIN-VAOV	14	50	39	100	9	83	39	100	41	100	4	50
ALRU (Shrub)	40	11	49	100	10	11	3	89	12	100	3	100
ALRU (Shrub)/TRCA3	32	45	40	82	31	45	32	100	56	100	1	45
ALSI	26	38	30	100	29	81	30	100	30	100	1	43
COST	39	29	14	57	62	100	15	67	26	100	10	71
OPHO	11	23	15	52	46	97	22	71	42	100	2	52
RIBR-RUSP/OXALIS	16	31	2	46	47	92	23	85	62	100	3	92

Table 3. Average % foliar cover and constancy of plant life forms by riparian type. Ave. Cov. = Mean percent foliar cover. Cons = % of plots on which the life form occurred. Mat. Trees are >=12' tall. T. Shrubs are >=1m. tall.

RIBR-RUSP/PEFR2	19	19	6	56	28	100	14	88	45	100	4	69
RIBR-RUSP/TOME			5	33	28	83	29	100	48	100	4	100
SASI2	30	57	8	86	50	71	9	71	14	100	8	86
SASI2/PEFR2	5	30	13	60	28	90	15	80	39	100	12	80
VAAL-VAOV	23	21	9	86	19	38	37	100	41	100	5	69
HERBACEOUS TYPES	**Mat. Trees** Ave. Cov.	% Cons	**Reg. Trees** Ave. Cov.	% Cons	**T. Shrubs** Ave. Cov.	% Cons	**L. Shrubs** Ave. Cov.	% Cons	**Forbs** Ave. Cov.	% Cons.	**Grasses** Ave. Cov.	% Cons
ADPE	43	26	7	48	11	70	6	57	48	100	8	78
CALE5			1	67	4	67	6	67	24	100	53	100
COAQ	4	33	1	33	2	67	1	33	73	100	2	67
EQAR	8	10	6	80	2	30	2	70	59	100	8	90
HYPE			1	33			3	67	10	100	6	100
LYAM			7	100	3	10	9	100	53	100	9	90
MIGU	35	17	4	28	9	11	3	56	41	100	12	89
OXALIS	27	33	2	44	4	78	2	33	68	100	5	67
PEFR2	15	21	3	74	5	29	3	74	52	100	5	88
SAAR4-SETR	3	13	8	75	18	38	13	75	59	100	3	75
SCMI			20	33			23	67	28	100	72	100
SETR-ASMO	11	56	5	89	2	11	6	100	45	100	4	100
STCO4-ATFI	9	25	1	38	2	13	6	88	61	100	2	75
STCO4-MIGU	15	17	4	33	6	42	7	33	55	100	13	100

Table 3. Average % foliar cover and constancy of plant life forms by riparian type - cont'd.

environmental factors. In this sample, forested types tended to occur on stabilized fluvial landforms, for the most part. Communities dominated by shrubs and herbaceous plants were associated with sites too wet, rocky or frequently disturbed to support forest vegetation, or were found as a "fringe" of vegetation between the stream edge and an adjacent forest stand.

Influences on Riparian Vegetation

Riparian vegetation is strongly influenced by the physical environment created by fluvial processes. Riparian vegetation is responsive to both direct stream action (timing, intensity, frequency and duration of high flows), and to the substrates, local water table conditions, and landforms created by fluvial activities. The **time since the last high flow event** is one of the key influences on riparian vegetation, coupled with the **intensity** and **duration** of the flow. These three factors control the degree to which the previous community

was disturbed and the type of substrate that remains (if either deposition or erosion occurred), as well as type of seeds or plant propagules that are present after the high water recedes. The **frequency** of high flows determines how succession from one community to another proceeds, or whether it proceeds at all. Areas of **high water table** or **actively eroding steep slopes** are also characteristic of riparian areas, and control the type of vegetation present.

Because of these factors, there is a tight link between riparian plant communities and fluvial landforms/substrates. In this study it was often observed that in a given site, each individual landform had its own particular plant community. This leads to interesting spatial relationships and differences in scale at which the vegetation senses the environment. Tiny landforms, such as small gravel deposits, have small, distinct communities. Larger landforms, such as river terraces, have extensive areas of relatively uniform vegetation. The "grain" of the mosaic of environments reflected in the vegetation tends to be more diverse than in typical upland sites.

All the factors described above cause certain categories of species to occur with higher frequency in riparian areas than in the typical upland forest - "**pioneer**" species adapted to rapidly grow and reproduce before the next flood (for example, common horsetail and red alder), **wetland** species adapted to high moisture and low oxygen in the rooting zone (for example, skunkcabbage and small-fruited bulrush), **species adapted to coarse-textured substrates** (willows, coltsfoot), and **species able to grow and reproduce in flowing water** (yellow monkeyflower, cold-water corydalis). These species, growing in communities along with plants more often found in upland situations, confer a distinctiveness and diversity to riparian vegetation.

Functions of Riparian Vegetation

Besides being affected *by*, riparian vegetation has an effect *on* both physical and biological stream processes to a significant degree. One of the key functions of riparian vegetation is **streambank stabilization**. Vegetation cover protects banks both from surface erosion and initiation of deeper-seated slides or debris flows. Riparian plant communities vary widely in their ability to carry out this function, which is dependent on both the extent to which vegetation cover develops, and the depth and strength of roots. In general, woody vegetation with a well-developed ground cover provides the greatest protection.

Riparian vegetation also **moderates high flows** to some degree by helping decrease the velocity of water flowing through it, and by **enhancing deposition of fine sediments and organic debris**.
At the same time, the vegetation may cause floodwaters to "spread" over a larger area, enlarging the extent of low intensity flooding. This function of the plant community also tends **mitigate downstream effects** of high flows as well.

Riparian vegetation is an important source both of **shade** and **input of foliar debris,** providing favorable stream temperatures and a source of food for aquatic organisms. The extent to which riparian vegetation performs these functions depends on the width of the stream, the proximity of the vegetation to the wetted stream edge, and the height of the vegetation. Tree-dominated riparian plant communities constitute a **source of large wood** essential for creation of structural habitats for aquatic organisms. Conifer communities close (less than a tree height) to the channel are the most valuable sources. The **wildlife habitat** provided by riparian vegetation for terrestrial animal species strongly influences the animal diversity in the landscape, as well as the ability of riparian areas to function as **corridors for dispersal and migration**.

RIPARIAN WILDLIFE HABITAT RELATIONSHIPS

Streamside riparian areas provide important habitat for a variety of wildlife species. The importance of riparian habitats is most pronounced in xeric areas where lack of moisture limits diversity and amounts of vegetation in upland habitats. Water for drinking is also limiting for some species of animals. In mesic areas, such as mountain streams in the western Cascades, the differences between riparian and upland habitats are not as pronounced (Doyle 1990, McGarigal and McComb 1992). In general, the smaller the stream the less distinct the riparian vegetation. In moist areas water for drinking is usually not limiting.

Riparian areas generally provide a higher diversity of vegetation structure and composition than upslope areas. Streams and rivers produce openings in the forest canopy which allows enough light for a well-developed understory of shrubs and forbs. This diversity of understory and proximity to water result in a greater supply of food for many wildlife species. Fruit and mast producing shrubs are more plentiful than in upslope areas. Forbs and deciduous shrubs provide for browsing and grazing.

Due to presence of water and diverse vegetation, invertebrate density is also higher in riparian areas, providing food for insectivorous wildlife species (Doyle 1990). Red alder leaves, in particular, support high levels of invertebrates providing food for forage gleaning birds (McComb 1994). Spaces between coarse substrates, such as cobbles and gravels, provide habitat for invertebrates.

Riparian vegetation provides hiding cover for a variety of wildlife and nest sites for birds. Riparian areas provide cool, moist microsites and thermal cover during extreme weather. Due to topography and presence of water, temperatures are moderated. The result is cooler temperatures in summer and warmer temperatures in winter when compared to upslope habitats.

Riparian areas are most important for water-dependent wildlife; these species require riparian habitat. Some species are more abundant in riparian habitats but are found regularly in upslope habitats. Other species use riparian habitats but are just as likely or more likely to be found in upslope habitats. A list of species using streamside riparian habitats is presented in Appendix E. Some "riparian" species use lakes but not streamside riparian habitat and are not included on this list.

Table E-1 (Appendix E) lists amphibians and reptiles that use streamside riparian habitats. Many amphibians return to water to breed. However, except for a few species, they aren't tied to riparian habitats during the non-breeding season. The "Riparian Species" column in Table E-1indicates those species that appear to be riparian dependent throughout their life cycle. Northwestern salamander, long-toed salamanders, rough-skinned newt, western toad, all the frogs except the tailed frog breed primarily in lakes and ponds but some will occasionally use slow moving water of rivers and streams. Of these species only the red-legged frog, Cascades frog, bull frog and spotted frog are listed as riparian species because they are closely tied to water throughout the year.

Reptiles, with the exception of the turtles and common garter snake can be found in riparian habitats but are just as likely or more likely to be found in upland habitats. The turtles use primarily lakes and ponds for feeding and resting habitat but will use slow moving water of rivers and larger streams.

Table E-2 (Appendix E) lists mammals that use streamside riparian habitat. Only a few mammals are truly dependent on riparian habitats (beaver, otter, muskrat, water shrews, and water vole). Some small mammals are found primarily in riparian areas but will use upslope habitats. These two groups are indicated as

"Riparian Species" in Table E-1. Riparian areas are important feeding sites for bats that capitalize on the higher insect densities over riparian areas. Mammalian predators are attracted to riparian habitat because of high densities of prey and also as travel corridors. Big game use riparian areas as thermal cover from cold winter temperatures and snows, and for relief from summer heat.

Historically, beaver have played an important role in montane riparian habitats. Current beaver populations are only a fraction of what they were during pre-European settlement of the Pacific Northwest (Olson and Hubert 1994). Reintroduction of beaver may enhance and restore riparian habitats. Benefits of beaver activity (primarily dams) on a riparian system include: reduced stream velocity resulting in reduction of streambank erosion; water storage which moderates runoff; filtering and trapping of sediments which reduces turbidity; enhancement of habitat for fish and wildlife; increased invertebrate production in beaver ponds.

Sites for beaver reintroduction are areas with appropriate topography and a food source. Smaller streams with less than a 15% gradient are more likely to be successfully colonized by beaver (Olson and Hubert 1994). Adjacent slopes should not be steep; Rosgen channel types B and C generally provide appropriate topography. Sites need to support or be adjacent to willow or alder which provide food and dam building materials. Beaver require large amounts of food and building material, thus isolated pockets of alder and willow would not be adequate to support a beaver colony. Olson and Hubert (1994) suggest 0.5 mile of stream channel with adjacent food and building material is required to maintain a beaver colony. Beavers tend to overuse an area and move on if adequate food and building material is not available. Willow and alder both resprout after cutting by beaver and thus are more resilient in areas used by beaver (McComb 1994, Olson and Hubert 1994).

A list of birds using streamside riparian habitat is given in Table E-3 (Appendix E). Many birds are dependent on riparian habitat. These species include: loons, grebes, ducks, wading birds, sandpipers, gulls, belted kingfisher, some songbirds, and American dipper. Some birds are strictly aquatic and do not actually use riparian vegetation. A number of aquatic birds are found only on lakes or wetlands along lakes and are not included in Table E-3. Loons, grebes and most of the gulls and ducks, with the exception of mergansers and harlequin ducks, are more common on lakes but can be found on rivers in slower moving water.

Many song birds are attracted to shrubby vegetation along streams. The shrubs provide nest sites, hiding cover, feeding substrate (for hunting insects), berries or seeds. Flower nectar is provided for hummingbirds. Shrubs also provide perch sites for flycatchers and kingfishers. Bald eagles and osprey fish on rivers and larger streams. Osprey usually nest in trees or snags close to the stream while eagles may nest up to a mile away.

HOW TO USE THIS GUIDE

This guide is intended to be used to identify riparian ecological types and understand the implications of their presence in the landscape, in terms of site potential and management opportunities/limitations. The process involves identifying the landform, substrate and plant community of the site, and making interpretations about their significance ecologically and with respect to management. **This key is intended to be used in "unmanaged" sites relatively free from the impacts of timber harvest, road building, etc.** In "non-natural" areas, limited interpretations about the site may be made from an examination of the landforms and substrate, and from the indicator value of dominant plant species present (see "Making Interpretations", below).

Identifying Landforms - Figs. 1 and 2 illustrate the fluvial landforms likely to occur in alluviated and entrenched valley types. Choose the landform that corresponds to the site in question. The possibilities are:

- □ Terrace
- □ Upper streambank (floodprone zone)
- □ Lower streambank (bankfull zone)
- □ Depositional bar or fan
- □ Island
- □ Rock cliff
- □ Floodplain wetland
- □ Inactive channel

Identifying substrate - Characterize the substrate layers as clay, silt, sand, gravel, cobbles, boulders or bedrock (or mixtures thereof); note the amount and decomposition state of organic matter. Examine the substrate profile to assess the number and texture of, and amount of organic matter within, different layers.

Identifying plant communities - Select a relatively homogeneous area, with regard to plant composition, landform and substrate. For forested sites, use a circular area roughly 40 feet in radius (approx. 500 m^2), if possible. For shrubby or herbaceous vegetation, use a rectangular area approx. 5 x 10 m. If the area is too small or irregular to accommodate these plot sizes, adjust accordingly.

Once the plot boundaries have been determined, use the keys on the following pages to identify the plant community. First make a list of the plants used in the keys that are present, then assess their percent foliar cover by ocular estimate. Appendix B has a guide for use in ocular estimation. Work through the couplets in the key until a tentative decision is reached. **Begin with the "Key to Lifeform Categories" on p. 16. When working through one of the keys, always start at the top (couplet #1) and work downwards; entering the key in the middle may lead to a wrong answer.** Your answer may lead you to a plant association that has been previously described in one of the upland Plant Association Guides; if this is the case, find the description in Appendix C and verify you have made the correct identification. Otherwise see riparian type descriptions, pp. 31ff, for verification. Verification should involve reading the description of the community and its environment, and if necessary, consulting the cover/constancy tables in Appendix D. **Verification is an essential step in the identification process, because the key only leads to the correct plant community type approximately 80% of the time.** If the answer seems incorrect after an attempt at verification has been made, try one of the communities listed in the section entitled "Similar Riparian Types in This Area" in the description of each riparian type.

It may not be possible to find a description that adequately characterizes the site in question. Although hundreds of plots went into this classification, inevitably some rarer types were missed, especially at higher elevations where little sampling was done.

Making interpretations - General interpretations regarding substrates and landforms may be found in the "Physical Environment" section of this guide, pp. 4-9. Further interpretations of the ecological types as a whole, including the vegetation, are included in the "Environment and Distribution", "Management Implications" and "Wildlife Habitat Relationships" sections for each type. In the case where determination of a type cannot be made either due to disturbance or lack of sampling, site interpretations can be made simply from the landforms, substrates and the indicator value of the species that are present. Table 4 lists the indicator value of some of the more common riparian species in this area.

KEYS TO RIPARIAN ECOLOGICAL TYPES

KEY TO LIFEFORM CATEGORIES

1A. Site is currently dominated by mature conifers (>=20% cover) or likely to become so in the future (>= 10% conifer regeneration), or a mix of hardwoods and conifers . . . . . see "Key to Conifer Forest Types", **p. 20.**
1B. Not as above **2**

2A. Site dominated by hardwoods (red alder (ALRU), black cottonwood (POTR2) or bigleaf maple (ACMA)), mature tree cover >=20%, conifer cover minimal . . . . . see "Key to Hardwood Forest Types", **p. 23.**
2B. Not as above **3**

3A. Site dominated by shrubs (>=20% cover), including immature red alder and black cottonwood . . . . . see "Key to Shrub Types", **p. 24.**
3B. Not as above **4**

4A. Site dominated by forbs and/or grasses (may be very sparsely vegetated) . . . . . see "Key to Herbaceous Types", **p. 26**.
4B. Not as above . . . . . You are presumably in an unvegetated area, or in a situation not covered by this guide.

Table 4. Codes, common and scientific names, and indicator values for the most common riparian plant species within the study area

Code	Scientific Name	Common Name	Indicator Value
TREES			
ACMA	*Acer macrophyllum*	Bigleaf maple	
ALRU	*Alnus rubra*	Red alder	Shade intol.; moist soils; disturb.
PIEN	*Picea engelmannii*	Engelmann spruce	
POTR2	*Populus trichocarpa*	Black cottonwood	Shade intol.; high soil moisture
TABR	*Taxus brevifolia*	Pacific yew	Shade tol.; forms thickets
THPL	*Thuja plicata*	Western redcedar	Moist to wet soils; high organ. mat.
TSHE	*Tsuga heterophylla*	Western hemlock	Moist soils; high organ. mat.
SHRUBS			
ACCI	*Acer circinatum*	Vinemaple	Drier, well-drained sites
ALIN	*Alnus incana*	Mountain alder	Moist, cool sites
ALSI	*Alnus sinuata*	Sitka alder	Wet, cool sites
COST	*Cornus stolonifera*	Red-osier dogwood	Wet soils
MEFE	*Menziesia ferruginea*	Fool's huckleberry	Moist, cool sites
OECE	*Oemleria cerasiformis*	Indian plum	Warm, moist sites
OPHO	*Oplopanax horridum*	Devilsclub	Wet soils
PHCA3	*Physocarpus capitatus*	Ninebark (westside)	
PHMA	*Physocarpus malvaceus*	Ninebark (eastside)	Well-drained soils
RHAL	*Rhododendron albiflorum*	Cascades azalea	Cold, wet sites
RIBR	*Ribes bracteosum*	Stinkcurrant	Wet soils
RILA	*Ribes lacustre*	Prickly currant	Cool, wet sites
RUPA	*Rubus parviflorus*	Thimbleberry	Shade intol.
RUSP	*Rubus spectabilis*	Salmonberry	Wet to moist soils
RUUR	*Rubus ursinus*	Trailing blackberry	
SASC	*Salix scouleriana*	Scouler's willow	Shade intol., moist soils
SASI2	*Salix sitchensis*	Sitka willow	Shade intol., moist to wet soils
SPDO	*Spiraea douglasii*	Douglas's spiraea	Cool, wet sites
VAAL	*Vaccinium alaskaense*	Alaska huckleberry	Cool , moist sites
VAME	*Vaccinium membranaceum*	Big huckleberry	Cool sites
VAOV	*Vaccinium ovalifolium*	Ovalleaf huckleberry	Cool, moist sites
VIED	*Viburnum edule*	High-bush cranberry	Cool; moist to wet
FORBS			
ACCO	*Aconitum columbianum*	Monkshood	Cool, wet sites
ACTR	*Achlys triphylla*	Vanillaleaf	Warm, moist sites
ADPE	*Adiantum pedatum*	Maidenhair fern	Wet soils or rock
ANAR2	*Angelica arguta*	Kneeling angelica	Wet soils
ANGE	*Angelica genuflexa*	Sharp-toothed angelica	Wet soils
ANMA	*Anaphalis margaritacea*	Pearly everlasting	Disturbed, open sites
ARAM	*Arnica amplexicaulis*	Clasping arnica	Wet soils
ARLA	*Arnica latifolia*	Mountain arnica	
ARMO	*Arnica mollis*	Hairy arnica	Cold, moist
ARSY	*Aruncus sylvester*	Goatsbeard	Moist to wet, warm sites
ASMO	*Aster modestus*	Few-flowered aster	Moist sites
ATFI	*Athyrium filix-femina*	Ladyfern	Moist to wet sites
BLSP	*Blechnum spicant*	Deerfern	Wet soils
BOEL	*Boykinia elata*	Slender boykinia	Warm, moist sites

BOMA	*Boykinia major*	Mountain boykinia	Moist to wet soils
CAAN2	*Cardamine angulata*	Angled bittercress	Wet sites
CABI	*Caltha biflora*	Marsh marigold	Very wet sites
CACO2	*Cardamine cordifolia*	Large mt. bittercress	Wet sites
CHLE2	*Chrysanthemum leucanthemum*	Oxeye daisy	Disturbed, open sites
CIAL	*Circaea alpina*	Enchanter's nightshade	Wet to moist, shady sites
CLUN	*Clintonia uniflora*	Queencup beadlily	
COAQ	*Corydalis aquae-gelidae*	Cold-water corydalis	Cool, wet sites; running water
COCA	*Cornus canadensis*	Bunchberry dogwood	Cool, moist, productive
COSC	*Corydalis scouleri*	Scouler's corydalis	Cool, moist to wet, productive
EPGL	*Epilobium glaberrimum*	Smooth willow-herb	Cool, moist to wet; open sites
EPGL2	*Epilobium glandulosum*	Common willow-herb	Cool, moist to wet; open sites.
EPLU	*Epilobium luteum*	Yellow willow-herb	Cool, moist to wet; open sites.
EPMI	*Epilobium minutum*	Small-flw. willow-herb	Cool, moist to wet; open sites.
EPWA	*Epilobium watsonii*	Watson's willow-herb	Cool, moist to wet; open sites.
EQAR	*Equisetum arvense*	Common horsetail	Disturbed sites, wet root zone
EQHY	*Equisetum hyemale*	Dutch rush	Disturbed sites, wet root zone
EQTE	*Equisetum telmateia*	Giant horsetail	Disturbed sites, wet root zone
GATR	*Galium triflorum*	Sweetscented bedstraw	
HELA	*Heracleum lanatum*	Cowparsnip	Wet soils
HYPE	*Hypericum perforatum*	Common St. John's Wort	Disturbed, open sites
LAMU	*Lactuca muralis*	Wall lettuce	Disturbed sites
LYAM	*Lysichitum americanum*	Skunkcabbage	Very wet soils
MEPA	*Mertensia paniculata*	Tall bluebells	Cool, moist sites
MIGU	*Mimulus guttatus*	Yellow monkeyflower	Wet sites, running water
MILE	*Mimulus lewisii*	Purple monkeyflower	Wet sites, running water
MIMO	*Mimulus moschatus*	Musk-flower	Wet sites
MOPA	*Montia parvifolia*	Candyflower	Moist to set sites
MOPE	*Montia perfoliata*	Miner's lettuce	Moist sites
MOSI	*Montia sibirica*	Siberian miner's lettuce	Warm, moist to wet
OESA	*Oenanthe sarmentosa*	Water-parsley	Wet sites close to running water
OXOR	*Oxalis oregana*	Oregon oxalis	Moist, productive sites
OXTR	*Oxalis trilliifolia*	Great oxalis	Moist, productive sites
PEFR2	*Petasites frigidus*	Coltsfoot	Wet rooting zone, open sites
POMU	*Polystichum munitum*	Swordfern	
RAUN2	*Ranunculus uncinatus*	Little buttercup	Wet soils
SAAR4	*Saxifraga arguta*	Brook saxifrage	Moist , near running water
SEPS	*Senecio pseudaureus*	Streambank groundsel	Wet soils
SETR	*Senecio triangularis*	Arrowleaf groundsel	Wet soils
STAM	*Streptopus amplexifolius*	Claspleaf twistedstalk	Wet to moist sites
STCO4	*Stachys cooleyae*	Cooley's hedgenettle	Wet to moist sites
TITRU	*Tiarella trifoliata unifoliata*	Coolwort foamflower	Moist, productive sites
TOME	*Tolmiea menziesii*	Piggyback plant	Moist soils
TRCA3	*Trautvetteria caroliniensis*	False bugbane	Cool, wet sites
URDI	*Urtica dioica*	Stinging nettle	Wet soils
VASI	*Valeriana sitchensis*	Sitka valerian	Cool to cold, moist to wet sites
VIGL	*Viola glabella*	Pioneer violet	
GRASSES & GRASSLIKES			
BRVU	*Bromus vulgaris*	Common brome	

CAAQD	*Carex aquatilis var. dives*	Water sedge	Wet soils
CADE	*Carex deweyana*	Dewey's sedge	Moist to wet sites
CALA	*Carex laeviculmis*	Smooth-stemmed sedge	Moist to wet sites
CALE5	*Carex lenticularis*	Lenticular sedge	Moist to wet sites
CILA2	*Cinna latifolia*	Wood-reed	Wet soils, running water
ELGL	*Elymus glaucus*	Blue wildrye	Dry to moist, open sites
GLEL	*Glyceria elata*	Sweet manna-grass	Moist, open sites
HOLA	*Holcus lanatus*	Common velvet-grass	Disturbance
PUPA	*Puccinellia pauciflora*	Weak alkaligrass	Moist, open sites, run. H2O
SCMI	*Scirpus microcarpus*	Small-fruited bulrush	Wet soils

KEY TO CONIFER FOREST TYPES

Note: All but 3 of the types in this key have been previously described in upland Plant Association/Management Guides for this area. Certain of those previously-described associations commonly occur in riparian areas as well as uplands. For convenience, they are included in this key, and are described in Appendix C. **If you are in a conifer forest type and it does not key out here, try the appropriate upland guide for the forest zone you are in.** Upland guides are available from the Area Ecology Program.

1A. Subalpine fir (ABLA2) >=2% cover in the understory and >=10% cover in the overstory . . . . . **Subalpine Fir Zone**[1]
1B. Not as above **2**

2A. Mountain hemlock (TSME) >=2% cover in the understory or >=10% cover in the overstory . . . . . **Mountain Hemlock Zone**[1]
2B. Not as above **3**

3A. Pacific silver fir (ABAM) >=2% cover in the understory or >=10% cover in the overstory . . . . . **Pacific Silver Fir Zone, lead 4**
3B. Not as above **8**

4A. Devilsclub (OPHO) >=5% cover . . . . . **ABAM/OPHO** (see Appendix C)
4B. Not as above **5**

5A. Fool's huckleberry (MEFE) cover >=5%, or greater than Alaska huckleberry (VAAL) . . . . . **ABAM/MEFE** (see Appendix C)
5B. Not as above **6**

6A. Alaska (VAAL) and/or **ovalleaf huckleberry** (VAOV) >=10%; oxalis (OXOR), salal (GASH), vinemaple (ACCI) and coolwort foamflower (TITRU) minor or absent **7**
6B. Not as above . . . . . You are in an upland type not included in this guide; see Plant Association and Management Guides for Pacific Silver Fir Zone[2]

7A. Site is in Washington . . . . . **ABAM/VAAL** (see Appendix C)
7B. Site is in Oregon . . . . . **ABAM/VAAL/COCA** (see Appendix C)

8A. Western hemlock (TSHE) >= 2% cover in the understory or >=10% cover in the overstory . . . . . **Western Hemlock Zone, lead 9**
8B. Not as above **16**

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[1] See "Plant Association and Management Guide for the Mountain Hemlock and Subalpine Zones - Gifford Pinchot and Mt. Hood National Forests", Smith and others, 1996.

[2] See "Plant Association and Management Guide for the Pacific Silver Fir Zone - Gifford Pinchot National Forest", Brockway and others, 1983; "Plant Association and Management guide for the Pacific Silver Fir Zone - Mt. Hood and Willamette National Forests", Hemstrom and others, 1982.

9A. Devilsclub (OPHO) >= 3% or the major shrub . . . . .**TSHE/OPHO/POMU** (Washington), **TSHE/OPHO/OXOR** (Oregon - westside), or **TSHE/OPHO/SMST** (Oregon - eastside) (see Appendix C)
9B. Not as above **10**

10A. Oregon oxalis (OXOR) >=5% cover and **Alaska huckleberry** (VAAL) <= 3% cover . . . . . **TSHE/POMU-OXOR** (see Appendix C)
10B. Not as above **11**

11A. Alaska huckleberry (VAAL) >=5% cover, salal (GASH) and Oregon oxalis (OXOR) uncommon, moist-site herbs (**vanillaleaf** (ACTR), **queencup beadlily** (CLUN), **bunchberry dogwood** (COCA), **starry Solomonseal** (SMST), **coolwort foamflower** (TITRU), **insideout flower** (VAHE)) dominant in varying combinations . . . . . **TSHE/VAAL/COCA** (see Appendix C)
11B. Not as above **12**

12A. Herbaceous layer dominated by **skunkcabbage** (LYAM) and other wet-site herbs (**ladyfern** (ATFI), **Cooley's hedgenettle** (STCO4), **piggyback plant** (TOME), **deer fern** (BLSP)) . . . . . **TSHE/LYAM** (see Appendix C)
12B. Not as above **13**

13A. West of the Cascade crest; **vanillaleaf** (ACTR) cover >= 10%, swordfern (POMU) cover < 10% . . . . . **TSHE/ACTR** (see Appendix C)
13B. Not as above **14**

14A. West of the Cascade crest; **swordfern** (POMU) cover >= 10%, dwarf Oregongrape (BENE) <10% cover . . . . . **TSHE/POMU** (see Appendix C)
14B. Not as above **15**

15A. East of the Cascade crest; grand fir (ABGR) >= 2% cover in understory, queencup beadlily (CLUN) and other moist-herbs (**vanillaleaf** (ACTR), **queencup beadlily** (CLUN), **bunchberry dogwood** (COCA), **starry Solomonseal** (SMST), **coolwort foamflower** (TITRU), **insideout flower** (VAHE)) dominant . . . . **TSHE-ABGR/CLUN** (see Appendix C)
15B. You are in an upland type not included in this guide; see Plant Association and Management Guides for Western Hemlock Zone[3]

16A. Western redcedar (THPL) >= 2% cover in understory or >= 10% cover in overstory . . . . . **Western Redcedar Zone, lead 17**
16B. Not as above **20B**

17A. Grand fir (ABGR) usually present and **skunkcabbage** (LYAM) the dominant herb . . . . . **ABGR-THPL/LYAM**, see p. 31
17B. Not as above **18**

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[3] See "Plant Association and Management Guide for the Western Hemlock Zone - Gifford Pinchot National Forest", Topik and others, 1986; "Plant Association and Management Guide for the Western Hemlock Zone - Mt. Hood National Forest, Halverson and others, 1986.

18A. **Oxalis** (OXOR) >= 3% cover, **salmonberry** (RUSP) and/or **stinkcurrant** (RIBR) the dominant shrubs , **red alder** (ALRU) often codominant with **western redcedar** (THPL). . . . .
THPL/RUSP/OXALIS, see p. 39
18B. Not as above **19**

19A. Oxalis absent or minor, other moist-site herbs (**ladyfern** (ATFI), **enchanter's nightshade** (CIAL), **Cooley's hedgenettle** (STCO4), **coltsfoot** (PEFR2)) dominant . . . . . **THPL/ATFI-STCO4**, see p. 35
19B. Not as above **20**

20A. East of the Cascade crest; **grand fir** (ABGR) usually >=2% cover in understory, **vanillaleaf** (ACTR) and other moist-site herbs (**queencup beadlily** (CLUN), **bunchberry dogwood** (COCA), **starry Solomonseal** (SMST), **coolwort foamflower** (TITRU), **insideout flower** (VAHE) dominant . . . . . **THPL-ABGR/ACTR** in Oregon, **THPL/ACTR** in Washington
20B. Not as above . . . . . You are in a site not covered in this guide; consult upland plant association guides.

KEY TO HARDWOOD FOREST TYPES

1A. Black cottonwood (POTR2) dominant; shrub and herb layers sparse . . . . . **POTR2**, see p. 83
1B. Red alder (ALRU) dominant in the tree layer **2**

2A. Understory dominated by grasses, mostly **blue wildrye** (ELGL); shrub and forb layers quite sparse . . . . . **ALRU/ELGL**, see p. 47
2B. Not as above **3**

3A. Coltsfoot (PEFR2) >= 10% cover and/or the major herb; shrubs <25% cover (except for **red alder** (ALRU) if site is in an early successional stage) . . . . . **ALRU/PEFR2**, see p. 59
3B. Not as above **4**

4A. Cover of tall shrubs (>1m. tall) >=20% **5**
4B. Cover of tall shrubs (>1m. tall) <20% **9**

5A. Thimbleberry (RUPA) the dominant shrub, **Cooley's hedgenettle** (STCO4) often present, other herbs sparse . . . . . **ALRU/RUPA**, see p. 63
5B. Not as above **6**

6A. Devilsclub (OPHO) the dominant shrub . . . . . **ALRU/OPHO**, see p. 51
6B. Not as above **7**

7A. Salmonberry (RUSP) and/or **stinkcurrant** (RIBR) the dominant shrubs **8**
7B. Vinemaple (ACCI) the dominant shrub, moist-site herbs (**ladyfern** (ATFI), **wall lettuce** (LAMU), **Siberian miner's lettuce** (MOSI), **Cooley's hedgenettle** (STCO4), **swordfern** (POMU), **piggyback plant** (TOME)) >=10% collectively . . . . . **ALRU/ACCI,** see p. 43

8A. Oxalis (OXOR, OXTR) the dominant herb . . . . . **ALRU/RUSP/OXALIS, see p. 67**
8B. Other moist-site herbs (ladyfern (ATFI), **wall lettuce** (LAMU), **Siberian miner's lettuce** (MOSI), **Cooley's hedgenettle** (STCO4), **swordfern** (POMU), **piggyback plant** (TOME)) dominant . . . . . **ALRU/RUSP/TOME**, see p. 71

9A. Oxalis (OXOR, OXTR) >5% cover and/or the dominant herb . . . . . **ALRU/OXALIS**, see p. 55
9B. Not as above **10**

10A. Siberian miner's lettuce (MOSI) and/or **piggyback plant** (TOME) are the dominant herbs . . . . . **ALRU/TOME-MOSI**, see p. 79
10B. Cooley's hedgenettle (STCO4) dominant; often in association with other moist-site herbs (**ladyfern** (ATFI), **enchanter's nightshade** (CIAL), **wall lettuce** (LAMU), **Siberian miner's lettuce** (MOSI), **swordfern** (POMU), **piggyback plant** (TOME)) . . . . . **ALRU/STCO4**, see p. 75

KEY TO SHRUB TYPES

1A. Red-osier dogwood (COST) the dominant shrub . . . . . **COST**, see p. 115
1B. Not as above **2**

2A. Vinemaple (ACCI) and **mountain alder** (ALIN) dominant, often with **ninebark** (PHCA3, PHMA); stinkcurrant (RIBR) and salmonberry (RUSP) <5% cover, collectively . . . . . **ACCI-ALIN**, see p. 91
2B. Not as above **3**

3A. Sitka willow (SASI2) >=10% cover and the dominant shrub **4**
3B. Not as above **5**

4A. Coltsfoot (PEFR2) >= 10% cover . . . . . **SASI2/PEFR2**, see p. 139
4B. Coltsfoot (PEFR2) < 10%, forbs generally sparse . . . . . **SASI2**, see p. 135

5A. Mountain alder (ALIN) >= 10% cover and/or the dominant shrub, in association with **ovalleaf huckleberry** (VAOV) . . . . . **ALIN-VAOV**, see p. 99
5B. Not as above **6**

6A. Devilsclub (OPHO) >=10% or the dominant shrub . . . . . **OPHO**, see p. 119
6B. Not as above **7**

7A. Red alder (ALRU) - shrubby form (up to 12' tall; if taller, use hardwood forest key) - dominant **8**
7B. Shrubs other than red alder dominant **10**

8A. False bugbane (TRCA3) and **Sitka valerian** (VASI) > 10% collectively; **Alaska** (VAAL) or **ovalleaf (VAOV) huckleberries** often present . . . . . **ALRU (Shrub)/TRCA3**, see p. 107
8B. Not as above **9**

9A. Herb layer very sparse . . . . . **ALRU (Shrub)**, see p. 103
9B. Not as above . . . . . type not in this key; check "Key to Hardwood Forest Types" on p. 23

10A. Vinemaple (ACCI) >=10% or the dominant shrub **11**
10B. Shrubs other than vinemaple dominant **12**

11A. Moist-site herbs (**ladyfern** (ATFI), **swordfern** (POMU), **Cooley's hedgenettle** (STCO4), **piggyback plant** (TOME)) >= 10% cover collectively . . . . . **ACCI/STCO4**, see p. 95
11B. Herb layer very sparse . . . . . **ACCI**, see p. 87

12A. Alaska (VAAL) and/or **ovalleaf huckleberry** (VAOV) and/or **fool's huckleberry** (MEFE) dominant shrubs; Sitka alder (ALSI) <5%; coltsfoot (PEFR2) <3% . . . . . **VAAL-VAOV**, see p. 143
12B. Not as above **13**

13A. Sitka alder (ALSI) >= 5% cover and/or the dominant shrub . . . . . **ALSI**, see p. 111
13B. Not as above **14**

14A. Salmonberry (RUSP) and/or **stinkcurrant** (RIBR) dominant, **coltsfoot** (PEFR2) >=5% and/or the

dominant herb . . . . . **RIBR-RUSP/PEFR2**, see p. 127
14B. Not as above **15**

15A. Salmonberry (RUSP) and/or **stinkcurrant** (RIBR) dominant, **oxalis** (OXOR, OXTR) >= 5% or the dominant forb . . . . . **RIBR-RUSP/OXALIS**, see p. 123
15B. Not as above **16**

16A. Salmonberry (RUSP) and/or **stinkcurrant** (RIBR) dominant, other moist-site herbs (**piggyback plant** (TOME), **ladyfern** (ATFI), **enchanter's nightshade** (CIAL), **Cooley's hedgenettle** (STCO4), **Siberian miner's lettuce** (MOSI)) >=5% cover or dominant, collectively . . . . . **RIBR-RUSP/TOME**, see p. 131
16B. Not as above . . . . . type not described in this guide

KEY TO HERBACEOUS TYPES

1A. **Common horsetail** (EQAR) >=20% cover, or the dominant species present . . . . . **EQAR**, see p. 159
1B. Not as above **2**

2A. **Small-fruited bulrush** (SCMI) the dominant species . . . . . **SCMI**, see p. 187
2B. Not as above **3**

3A. Community dominated by **sedges**, mainly **lenticular sedge** (CALE5) . . . . . **CALE5**, see p. 151
3B. Not as above **4**

4A. **Common St. John's Wort** (HYPE) the dominant herb, sometimes in association with **blue wildrye** (ELGL); vegetation generally very sparse . . . . . **HYPE**, see p. 163
4B. Not as above **5**

5A. **Yellow monkeyflower** (MIGU) >=5% or the dominant forb **6**
5B. Not as above **7**

6A. **Cooley's hedgenettle** (STCO4) >=5% cover, codominant with **yellow monkeyflower** (MIGU) . . . . . **STCO4-MIGU**, see p. 199
6B. **Yellow monkeyflower** (MIGU) dominant, Cooley's hedgenettle (STCO4) < 5% cover . . . . . **MIGU**, see p. 171

7A. **Skunkcabbage** (LYAM)>=10% cover or the dominant forb . . . . . **LYAM**, see p. 167
7B. Not as above **8**

8A. **Cold-water corydalis** (COAQ) the dominant forb . . . . . **COAQ**, see p. 155
8B. Not as above **9**

9A. **Maidenhair fern** (ADPE) a dominant forb, may be associated with **ladyfern** (ATFI) or **goatsbeard** (ARSY) . . . . . **ADPE**, see p. 147
9B. Not as above **10**

10A. **Oxalis** (OXOR, OXTR) >=10% cover and/or the dominant forb, or codominant with **ladyfern** (ATFI) and/or **Scouler's corydalis** (COSC) . . . . . **OXALIS**, see p. 175
10B. Not as above **11**

11A. **Coltsfoot** (PEFR2) the dominant forb, other herbs generally sparse . . . . . **PEFR2**, see p. 179
11B. Not as above **12**

12A. **Cooley's hedgenettle** (STCO4) the dominant forb, often associated with **ladyfern** (ATFI) and/or **piggyback plant** (TOME) . . . . . **STCO4-ATFI**, see p. 195
12B. Not as above **13**

13A. Herb layer dominated by **brook saxifrage** (SAAR4) and **arrowleaf groundsel** (SETR), often with **marsh marigold** (CABI) . . . . . **SAAR4-SETR**, see p. 183
13B. Not as above **14**

14A. Herb layer a variety of cool/moist-site herbs (monkshood (ACCO), few-flowered aster (ASMO), tall bluebells (MEPA), streambank groundsel (SEPS), arrowleaf groundsel (SETR), false bugbane (TRCA3), insideout flower (VAHE), Sitka valerian (VASI) . . . . . **SETR-ASMO**, see p. 191
14B. Not as above . . . . . type not described in this guide

CONIFER FOREST TYPES

CODE	COMMON NAME	SCIENTIFIC NAME	PG	ECOCLASS
ABGR-THPL/LYAM	Grand Fir-W. Redcedar/Skunkcabbage	*Abies grandis-Thuja plicata/Lysichitum americanum*	31	CWM210
THPL/ATFI-STCO4	W. Redcedar/Ladyfern-C. Hedgenettle	*Thuja plicata/Athyrium filix-femina-Stachys cooleyae*	35	CCF110
THPL/RUSP/OXALIS	W. Redcedar/Salmonberry/Oxalis	*Thuja plicata/Rubus spectabilis/Oxalis* spp.	39	CCS110

HARDWOOD FOREST TYPES

CODE	COMMON NAME	SCIENTIFIC NAME	PG	ECOCLASS
ALRU/ACCI	Red Alder/Vinemaple	*Alnus rubra/Acer circinatum*	43	HAS311
ALRU/ELGL	Red Alder/Blue Wildrye	*Alnus rubra/Elymus glaucus*	47	HAF221
ALRU/OPHO	Red Alder/Devilsclub	*Alnus rubra/Oplopanax horridum*	51	HAS411
ALRU/OXALIS	Red Alder/Oxalis	*Alnus rubra/Oxalis* spp.	55	HAF222
ALRU/PEFR2	Red Alder/Coltsfoot	*Alnus rubra/Petasites frigidus*	59	HAF223
ALRU/RUPA	Red Alder/Thimbleberry	*Alnus rubra/Rubus parviflorus*	63	HAS111
ALRU/RUSP/OXALIS	Red Alder/Salmonberry/Oxalis	*Alnus rubra/Rubus spectabilis/Oxalis* spp.	67	HAS112
ALRU/RUSP/TOME	Red Alder/Salmonberry/Piggyback Pl.	*Alnus rubra/Rubus spectabilis/Tolmeia menziesii*	71	HAS113
ALRU/STCO4	Red Alder/Cooley's Hedgenettle	*Alnus rubra/Stachys cooleyae*	75	HAF224
ALRU/TOME-MOSI	Red Alder/Piggyback Pl.- Sib. Miner's Lettuce	*Alnus rubra/Tolmeia menziesii-Montia sibirica*	79	HAF225
POTR2	Black Cottonwood	*Populus trichocarpa*	83	HCS1

Table 5. Common and scientific names and codes for riparian ecological types

SHRUB TYPES

CODE	COMMON NAME	SCIENTIFIC NAME	PG	ECOCLASS
ACCI	Vinemaple	*Acer circinatum*	87	SW70
ACCI-ALIN	Vinemaple-Mountain Alder	*Acer circinatum-Alnus incana*	91	SW7111
ACCI/STCO4	Vinemaple/Cooley's Hedgenettle	*Acer circinatum/Stachys cooleyae*	95	SW7112
ALIN-VAOV	Mountain Alder-Ovalleaf Huckleberry	*Alnus incana-Vaccinium ovalifolium*	99	SW2131
ALRU	Red Alder	*Alnus rubra*	103	SW2511
ALRU/TRCA3	Red Alder/False bugbane	*Alnus rubra/Trautvettaria caroliniensis*	107	SW2512
ALSI	Sitka Alder	*Alnus sinuata*	111	SW2132
COST	Red-Osier Dogwood	*Cornus stolonifera*	115	SW4131
OPHO	Devilsclub	*Oplopanax horridum*	119	SW7113
RIBR-RUSP/OXALIS	Stinkcurrant-Salmonberry/Oxalis	*Ribes bracteosum-Rubus spectabilis/Oxalis* spp.	123	SW5121
RIBR-RUSP/PEFR2	Stinkcurrant-Salmonberry/Coltsfoot	*Ribes bracteosum-Rubus spectabilis/Petasites frigidus*	127	SW5122
RIBR-RUSP/TOME	Stinkcurrant-Salmonberry/Piggyback P.	*Ribes bracteosum-Rubus spectabilis/Tolmeia menzies.*	131	SW5123
SASI2	Sitka Willow	*Salix sitchensis*	135	SW1131
SASI2/PEFR2	Sitka Willow/Coltsfoot	*Salix sitchensis/Petasites frigidus*	139	SW1132
VAAL-VAOV	Alaska Huckleberry/Ovalleaf Huckleb.	*Vaccinium alaskaense-Vaccinium ovalifolium*	143	SW4132

Table 5. Common and scientific names and codes for riparian ecological types - cont'd.

HERBACEOUS TYPES

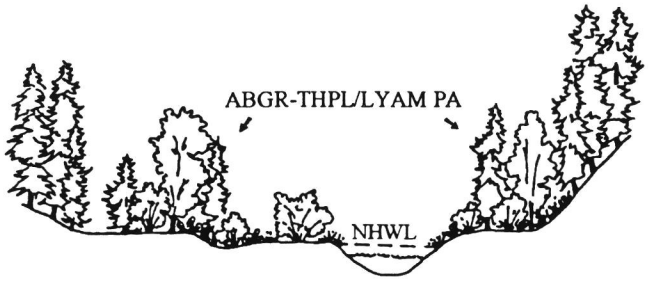
CODE	COMMON NAME	SCIENTIFIC NAME	PG	ECOCLASS
ADPE	Maidenhair Fern	*Adiantum pedatum*	147	FW4221
CALE5	Lenticular Sedge	*Carex lenticularis*	151	MM2931
COAQ	Cold-Water Corydalis	*Corydalis aquae-gelidae*	155	FW4231
EQAR	Common Horsetail	*Equisetum arvense*	159	FW4222
HYPE	Common St. John's Wort	*Hypericum perforatum*	163	No code
LYAM	Skunkcabbage	*Lysichitum americanum*	167	FW4223
MIGU	Yellow Monkeyflower	*Mimulus guttatus*	171	FW4224
OXALIS	Oxalis	*Oxalis* spp.	175	FW4225
PEFR2	Coltsfoot	*Petasites frigidus*	179	FW4226
SAAR4-SETR	Brook Saxifrage-Arrowleaf Groundsel	*Saxifraga arguta-Senecio triangularis*	183	FW4227
SCMI	Small-fruited Bulrush	*Scirpus microcarpa*	187	MT1921
SETR-ASMO	Arrowleaf Groundsel-Few-flowered Aster	*Senecio triangularis-Aster modestus*	191	FW4228
STCO4-ATFI	Cooley's Hedgenettle-Ladyfern	*Stachys cooleyae-Athyrium filix-femina*	195	FW4229
STCO4-MIGU	Cooley's Hedgenettle-Yel. Monkeyfl.	*Stachys cooleyae-Mimulus guttatus*	199	FW4230

Table 5. Common and scientific names and codes for riparian ecological types - cont'd.

ABGR-THPL/LYAM PLANT ASSOCIATION **CWM210**

Abies grandis-Thuja plicata/Lysichitum americanum
Grand Fir-Western Redcedar/Skunkcabbage

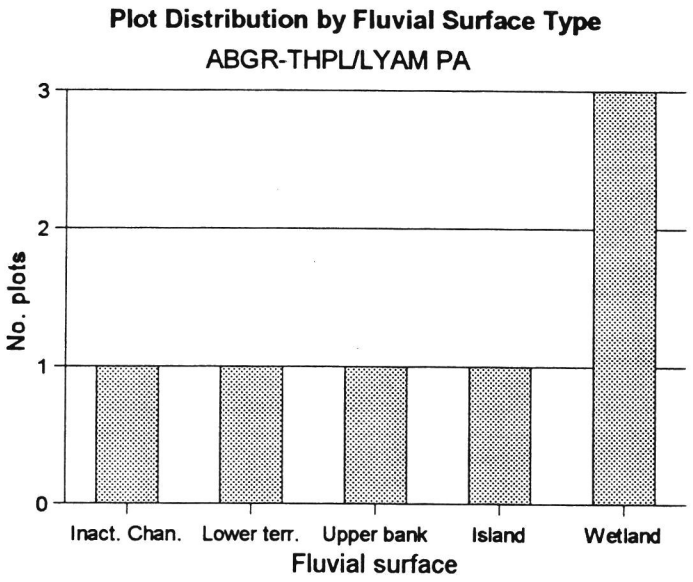
No. Plots = 7

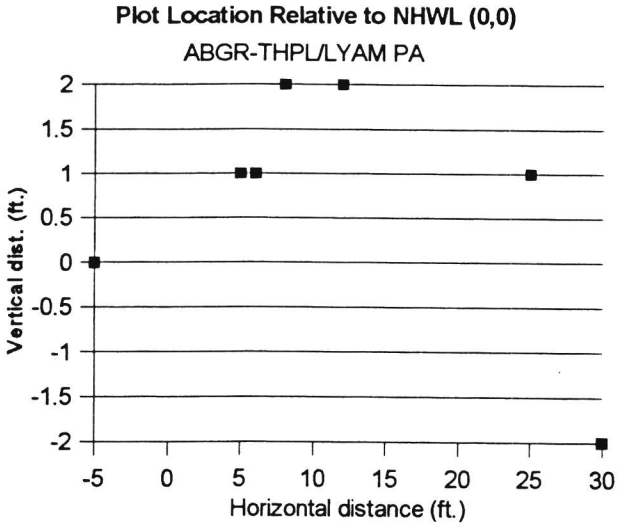


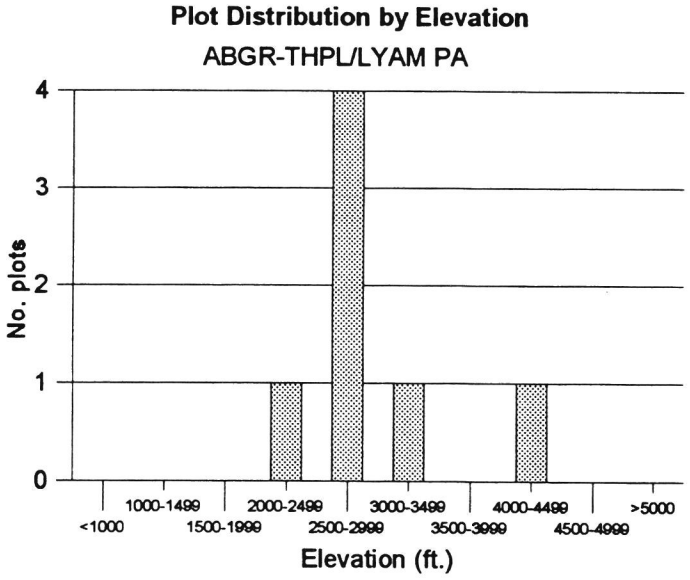
VEGETATION COMPOSITION AND STRUCTURE -- The ABGR-THPL/LYAM plant association (PA) is a conifer-dominated community with a moderate cover of shrubs and a well-developed herbaceous layer. The overstory canopy is relatively open, ranging between roughly 20% and 50% foliar cover in this sample. Moss cover is variable. In mature stands, the overstory tree layer contains western redcedar (THPL), grand fir (ABGR) and occasionally Engelmann spruce (PIEN); these three species also dominate the regeneration layer, sometimes along with western hemlock (TSHE) or Pacific yew (TABR). Mountain alder (ALIN) occurs frequently, and is most abundant under an open canopy. Skunkcabbage (LYAM) consistently dominates the herbaceous layer, and is often associated with ladyfern (ATFI), along with small amounts of sweet-scented bedstraw (GATR), arrowleaf groundsel (SETR), claspleaf twistedstalk (STAM) or other moisture-loving species. There was an average of 22.7 vascular plant species per plot in this sample of the ABGR-THPL/LYAM PA, with an average of 6.8 dominant species. These are high values compared to riparian types overall.

SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Thuja plicata	THPL	43	40
Trees (regen.)			
Abies grandis	ABGR	71	9
Picea engelmannii	PIEN	43	7
Thuja plicata	THPL	57	5
Tsuga heterophylla	TSHE	43	10
Shrubs			
Alnus incana	ALIN	57	22
Forbs			
Athyrium filix-femina	ATFI	71	15
Galium triflorum	GATR	71	1
Lysichitum americanum	LYAM	100	37
Senecio triangularis	SETR	71	4
Streptopus amplexifolius	STAM	86	1
Stachys cooleyae	STCO4	57	5
Grasses/grasslikes			
Carex laeviculmis	CALA	57	11
Moss		100	16
Bare sand/soil		86	3
Cobbles		14	1

ENVIRONMENT AND DISTRIBUTION -- The ABGR-THPL/LYAM PA represents saturated floodplain sites that are infrequently inundated, and have a relatively long growing season. There is one ecotype, the ABGR-THPL/LYAM Floodplain Wetland ET, defined for this plant association. In this sample it occurred in the floodprone zone, on flat or gently sloping depositional landforms of various types, all having saturated soils composed of silts/sands or silt/peat/muck combinations. These substrates commonly evidenced signs of soil development and organic matter incorporation. There was little bare soil or rock. For the most part, plots were 1 to 2 feet above and at least 5 feet away from the normal high-water line. All of the plots in this type were east of the Cascade Crest within the broader context of the Grand Fir Zone, in







moderately slope bound or (most commonly) alluviated valleys (Rosgen B and C channel type), mostly between 2200 and 3000 feet in elevation.

MANAGEMENT IMPLICATIONS -- The ABGR-THPL/LYAM PA probably represents the potential vegetation in sites where it occurs. Being dominated by conifers, stands of this type contribute significantly to the potential for large wood to the stream, although stem density is lower than in a typical upland forest type due to the high water table and scarcity of suitable microsites for conifer development. This association also functions to provide shade (important in the warm-dry climate of the Grand Fir Zone) and streambank stabilization. Foliar input to the stream is probably relatively low and consists mostly of conifer needles.

Compared to riparian sites overall, this plant association represents relatively stable conditions. Most of the

plots in this type had trees older than 100 years, indicating it has been at least that long since a major flood event has altered the substrate. Revegetation of sites that have been disturbed by natural events or management activities is likely to be strongly influenced by the high water table. Drier microsites suitable for conifer establishment may be sparse, and a closed canopy forest may not be possible in many instances. If the overstory canopy is reduced significantly, the shrub component is likely to respond vigorously. Mountain alder, red-osier dogwood (COST) and possibly vine maple (ACCI - if elsewhere in the vicinity) are good candidates for rehabilitation of these sites. Where the ABGR-THPL/LYAM PA occurs, ground disturbance carries a risk of sedimentation of the adjacent stream.

WILDLIFE HABITAT RELATIONSHIPS -- Conifer forests provide nesting and foraging habitat for a number of canopy dwelling birds. Seed-eating birds consume conifer seeds and western redcedar fruit. Regenerating trees, salmonberry, vine maple, and prickly currant provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Mountain alder seeds, buds, and catkins are consumed by seed eating birds such as siskins, chickadees, and finches. Grouse consume buds and needles of grand fir and Engelmann spruce. Small mammals, rabbits, and hares eat the twigs and leaves of mountain alder. Beaver use mountain alder to build dams and as a source of food.

These sites may occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ABGR-THPL/LYAM PC is usually located in areas of flat to gentle topography at moderate to high elevations, providing good big game transition and summer habitat. These sites remain cool and moist during the summer providing relief from the heat. Mountain alder, western hemlock, western redcedar, lady fern, and groundsel provide moderate to high quality forage. Sweetscented bedstraw, skunkcabbage, and coolwort foamflower provide lower quality forage.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- Riparian types that occurred most frequently with the ABGR-THPL/LYAM PA in this sample were the Mountain alder-Ovalleaf huckleberry (ALIN-VAOV) and Skunkcabbage (LYAM) associations.

UPLAND -- The ABGR-THPL/LYAM PA most commonly occurred adjacent to warm Grand Fir (Topik and others, 1988) plant associations: Western Redcedar-Grand fir/Vanillaleaf, (THPL-ABGR/ACTR), Western Hemlock-Grand Fir/Queencup Beadlily (TSHE-ABGR/CLUN), Grand Fir/Elk Sedge (ABGR/CAGE), Grand Fir/Snowberry (ABGR/SYMPH) and Grand Fir/Starflower (ABGR/TRLA2).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ABGR-THPL/LYAM PA may be confused with the following types, and can be distinguished from them as noted below:

- □ THPL/ATFI-STCO4 PA - lacks a dominance of skunkcabbage in the forb layer
- □ ALIN-VAOV PA - ovalleaf huckleberry is dominant in the shrub layer; lacks a tree component and dominance of skunkcabbage; drier sites
- □ STCO4-ATFI PA - lacks tree component and dominance of skunkcabbage
- □ LYAM PA - lacks tree component; understory is very similar to ABGR-THPL/LYAM

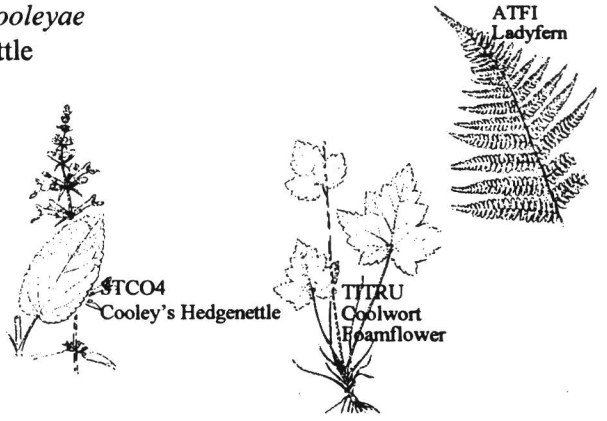
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ABGR-THPL/LYAM PA has not been described elsewhere in the Pacific Northwest.

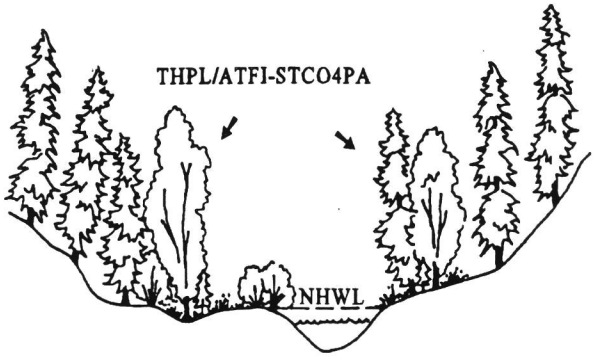
THPL/ATFI-STCO4 PLANT ASSOCIATION **CCF110**

Thuja plicata/Athyrium filix-femina-Stachys cooleyae

Western Redcedar/Ladyfern-Cooley's Hedgenettle

No. Plots = 13

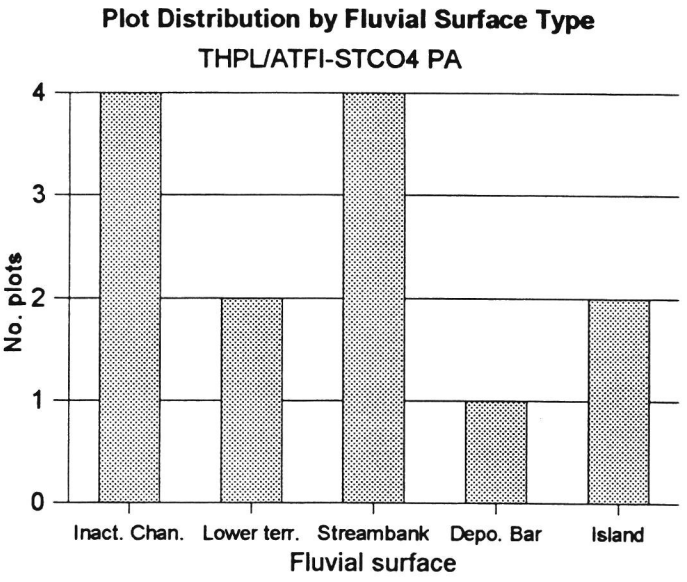




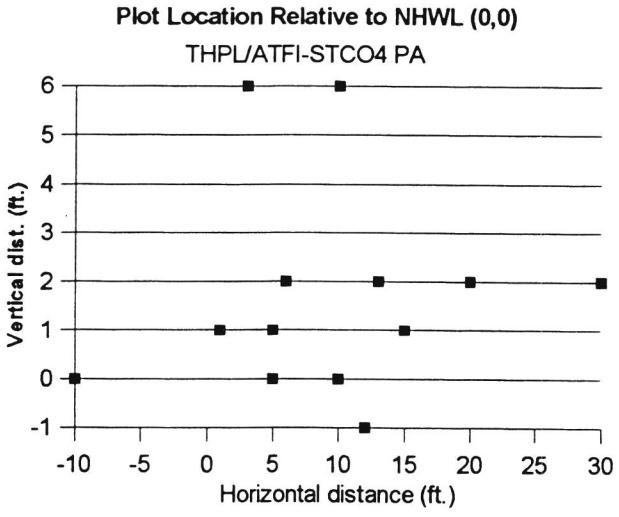
VEGETATION COMPOSITION AND STRUCTURE -- The THPL/ATFI-STCO4 plant association (PA) is a mixed conifer-hardwood community with a sparse to moderate shrub layer and a well-developed forb component. The canopy is most often closed in older stands and commonly exceeds 150 feet in height. Moss cover is usually relatively high in older stands, but may be low (2-5%) in earlier successional stages. The overstory is dominated by western redcedar (THPL), frequently in association with red alder (ALRU). The regeneration layer is composed mostly of scattered western redcedar and red alder seedlings, sometimes accompanied by grand fir (ABGR) or western hemlock (TSHE). The most common shrub is prickly currant (RILA); vinemaple (ACCI), baldhip rose (ROGY) and salmonberry (RUSP) may also occur. In general, shrub cover is less than 15%. The forb layer consists of a diverse and variable mix of moist-site species. The most prevalent are sweetscented bedstraw (GATR), ladyfern (ATFI), Cooley's hedgenettle (STCO4), pioneer violet (VIGL), enchanter's nightshade (CIAL) and coolwort foamflower (TITRU); several other species may occur as well, and none of the aforementioned species

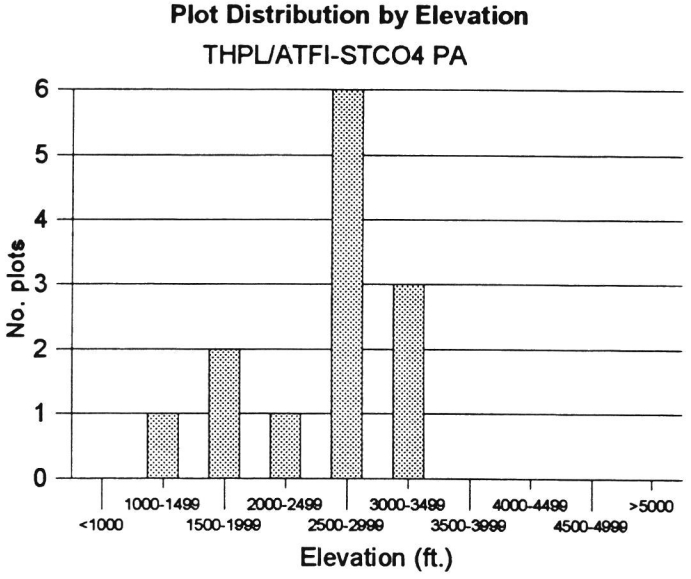
SPECIES	CODE	CONS.	%COV
Trees (mature)			
Alnus rubra	ALRU	38	33
Thuja plicata	THPL	85	27
Trees (regen.)			
Abies grandis	ABGR	31	1
Alnus rubra	ALRU	46	8
Thuja plicata	THPL	69	6
Tsuga heterophylla	TSHE	38	3
Shrubs			
Acer circinatum	ACCI	31	15
Ribes lacustre	RILA	69	9
Rosa gymnocarpa	ROGY	46	2
Rubus spectabilis	RUSP	31	9
Forbs			
Athyrium filix-femina	ATFI	69	8
Circaea alpina	CIAL	46	2
Galium triflorum	GATR	92	3
Linnaea borealis	LIBO2	38	5
Petasites frigidus	PEFR2	31	11
Polystichum munitum	POMU	38	7
Senecio triangularis	SETR	31	5
Stachys cooleyae	STCO4	54	16
Tiarella tri. var. unifol.	TITRU	46	1
Viola glabella	VIGL	54	2
Moss		62	29
Bare sand/soil		62	9
Gravel		31	14
Cobbles		38	13
Rock		46	10

occurred on every plot in this sample. There was an average of 23.0 vascular plant species per plot in this sample of the THPL/ATFI-STCO4 PA, with an average of 6.6 dominant species. These are among the highest values for riparian types overall.



ENVIRONMENT AND DISTRIBUTION -- The THPL/ATFI-STCO4 PA represents moist, productive riparian sites with a relatively long growing season and infrequent exposure to high flows. One ecotype, the THPL/ATFI-STCO4 Floodplain ET, is defined for this association. In this sample, it occurred on a variety of flat to gently-sloping landforms (primarily inactive stream channels, terraces and upper streambanks) within the floodprone zone in both incised and





alluviated mountain valleys (Rosgen B and C channel types). The widths of both the bankfull and floodprone zones in this sample were extremely variable. This type was generally found 1 to 6 feet above the normal high-water line and 1 to 30 feet away. Substrates were primarily deep sand/silt mixtures or several cm. of sand and silt over cobbles. Our plots showed evidence of soil development and incorporation of organic matter. The vegetation present suggests the soils are adequately drained and moist throughout much of the growing season. Plots in this sample were located mostly between 2000 and 3500 feet in elevation, throughout the study area. It tended to be more common east of the Cascade crest, but was found on the west side as well.

MANAGEMENT IMPLICATIONS -- The THPL/ATFI-STCO4 PA likely represents the potential vegetation in sites where it occurs. The plots in this sample reflected a variety of successional stages; in earlier stages, not surprisingly, the conifer component was less dominant and light-loving species tended to

become more prominent in response to the open conditions, especially red alder, ladyfern, prickly currant and Cooley's hedgenettle. Mature stands with this association have a variety of riparian functions; they provide a significant source of large wood to the stream, shade, nitrogen fixation (red alder), foliar input and slope stabilization.

These are sites that are infrequently reworked by flooding. Several of our plots had trees older than 100 years, indicating a long period of surface stability. With removal of the canopy, a vigorous response by red alder, prickly currant and ladyfern, as well as other moist-site herbs, can be expected. Red alder is a good candidate for rehabilitation of disturbed sites in this type, both because of ease of establishment and its ability to enhance site productivity through nitrogen fixation. Ground disturbance in this type carries a risk of sedimentation to the adjacent stream.

WILDLIFE HABITAT RELATIONSHIPS -- Mixed conifer and hardwood forests provide a diversity of nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins and western redcedar fruit. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap.

Regenerating trees, salmonberry, vine maple, and prickly currant provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Salmonberry, prickly currant, baldhip rose, and vine maple provide fruit and seeds for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder and salmonberry. Salmonberry flowers also provide nectar for hummingbirds.

These sites may occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The THPL/ATFI-STCO4 PA is usually located in areas of flat to gentle topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, western hemlock, and western redcedar, along with salmonberry, vine maple, and ferns provide year-round forage. Additional moderate forage is available in the forb layer during spring and summer. These sites are probably used year-round by deer, and fall through spring by elk. Nitrogen fixation by alder may improve the quality of forage on these sites.

ADJACENT VEGETATION COMMUNITIES

RIPARIAN -- The riparian types that were most often found adjacent to the THPL/ATFI-STCO4 PA were: the Vinemaple/Cooley's Hedgenettle (ACCI/STCO4) PA, Coltsfoot (PEFR2) PC, Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) PA and Cooley's Hedgenettle-Ladyfern (STCO4/ATFI) PA.

UPLAND -- The THPL/ATFI-STCO4 PA in this sample occurred in conjunction with a variety of Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986), lower Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) and Grand Fir Zone (Topik and others, 1988) plant associations indicative of moist conditions. The most common were the Western Redcedar-Grand Fir/Vanillaleaf (THPL-ABGR/ACTR) and Western Hemlock/Swordfern (TSHE/POMU) associations, followed by the Pacific Silver Fir/Devilsclub (ABAM/OPHO) and Grand Fir/Vinemaple/Vanillaleaf (ABGR/ACCI/ACTR) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The THPL/ATFI-STCO4 PA may be confused with the

following types, and can be distinguished from them as noted below:

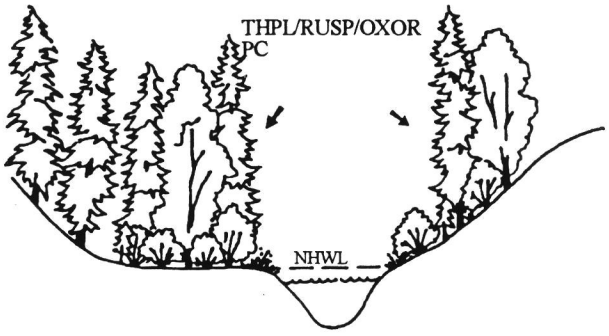
- □ ABGR-THPL/LYAM PA - "swampier" type, has dominance of skunkcabbage
- □ THPL/RUSP/OXOR PA - shrubs (salmonberry, stinkcurrant) and oxalis dominant
- □ ALRU/STCO4 PC - lacks western redcedar, otherwise very similar
- □ ACCI/STCO4 PA - lacks conifer component; more often in steep, incised valleys
- □ STCO4-ATFI PA - lacks conifer and shrub component, often coarser substrates

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The THPL/ATFI-STCO4 PA has not been described elsewhere in the Pacific Northwest.

THPL/RUSP/OXOR PLANT COMMUNITY **CCS110**

Thuja plicata/Rubus spectabilis/Oxalis oregana
Western Redcedar/Salmonberry/Oregon Oxalis

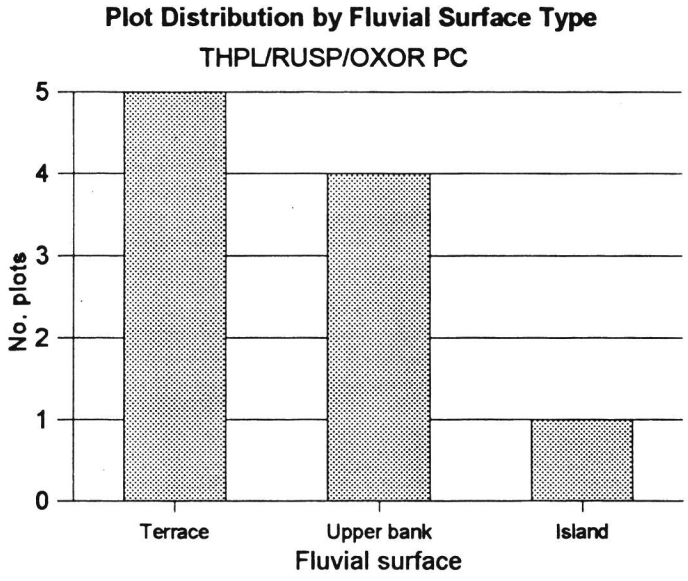
No. Plots = 10

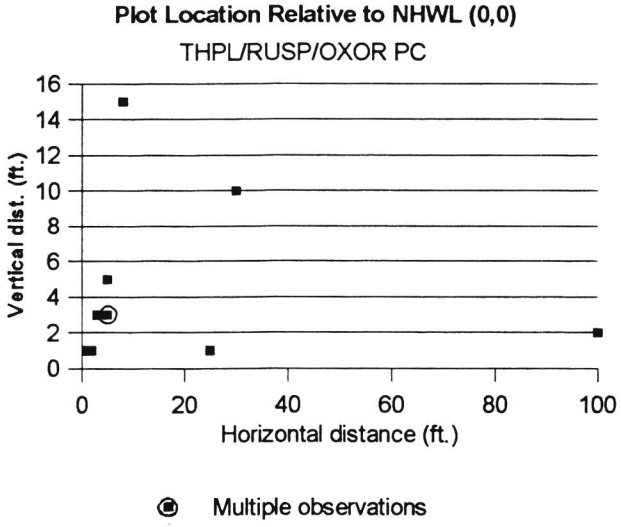


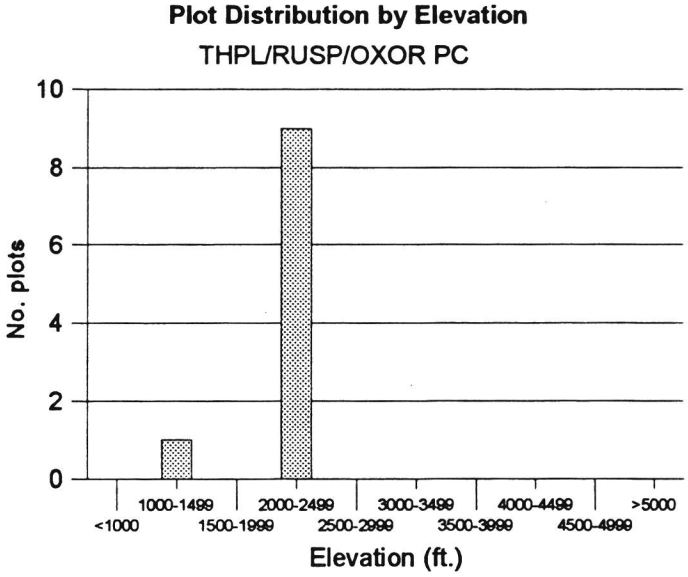
VEGETATION COMPOSITION AND STRUCTURE -- The THPL/RUSP/OXOR plant community (PC) is a mixed conifer and deciduous hardwood community with well-developed shrub and forb layers. The canopy in mature stands is generally closed and can exceed 100 feet in height. Moss cover is variable. Western redcedar (THPL) dominates the overstory, often along with red alder (ALRU). In this sample, tree regeneration was very sparse, and western hemlock (TSHE) was the species most commonly encountered. The shrub layer consists of salmonberry (RUSP) and/or stinkcurrant (RIBR), often with smaller amounts of devilsclub (OPHO). The forb layer is dominated by Oregon oxalis (OXOR) and ladyfern (ATFI), often with a significant amount of Scouler's corydalis (COSC). Other frequently-encountered species are Pacific waterleaf (HYTE), swordfern (POMU), piggyback plant (TOME), oakfern (GYDR) and Cooley's hedgenettle (STCO4). There was an average of 17.4 vascular plant species per plot in this sample of the THPL/RUSP/OXOR PC, with an average of 5.6 dominant species. These are average values for riparian types overall.

SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	70	26
Thuja plicata	THPL	100	37
Trees (regen.)			
Alnus rubra	ALRU	10	12
Thuja plicata	THPL	20	1
Tsuga heterophylla	TSHE	40	3
Shrubs			
Oplopanax horridum	OPHO	40	3
Ribes bracteosum	RIBR	90	13
Rubus spectabilis	RUSP	90	18
Forbs			
Athyrium filix-femina	ATFI	90	8
Corydalis scouleri	COSC	60	23
Gymnocarpium dryopteris	GYDR	40	9
Hydrophyllum tenuipes	HYTE	60	8
Oxalis oregana	OXOR	100	22
Polystichum munitum	POMU	80	8
Stachys cooleyae	STCO4	40	2
Tolmiea menziesii	TOME	60	2
Moss		80	17
Bare sand/soil		70	5
Gravel		20	3
Cobbles		10	1
Rock		10	1

ENVIRONMENT AND DISTRIBUTION -- The THPL/RUSP/OXOR PC represents somewhat moist, productive riparian sites with a relatively long growing season and infrequent exposure to high flows. In this sample it occurred on flat to sloping terraces and streambanks well above (generally 1 to 5 feet) the normal high-waterline and 1 to 15 feet away. Substrates were usually deep mixtures of sand, silt and/or volcanic ash, occasionally over a layer of cobbles (in which case the finer-textured layers were at least 30 cm. deep), with abundant organic matter. All but one of the plots in this type were located in the North Fork of the Clackamas River drainage below 2500 feet in elevation (the remaining plot was in the Quartz Creek drainage). The overall distribution of this







type is unknown, but it probably occurs in other drainages near the western edge of the study area; it is unlikely to occur east of the Cascade crest, or at higher elevations. The stream segments where it was found in this sample were alluviated mountain valleys of varying widths (Rosgen B and C channel types).

MANAGEMENT IMPLICATIONS -- It is uncertain whether the THPL/RUSP/OXOR PC represents the potential vegetation of sites where it occurs. In this sample, many plots lacked regenerating trees that would have provided clues as to successional relationships. Where regeneration did occur it was often western hemlock, suggesting that this type may be successional to the upland Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR; Halverson and others, 1986) association. Most of the trees measured in this sample were less than 80 years old. This plant community fulfills a number of riparian functions; it provides a significant source of large wood to the stream, shade, nitrogen fixation (red alder) and slope stabilization.

These are sites that are infrequently reworked by flooding. When the canopy is opened up, a vigorous response by salmonberry, stinkcurrant and red alder can be expected. These three species are also good candidates for site rehabilitation in this type. Where soil disturbance occurs, there is a risk of finer sediments being transported to the stream, especially on steeper slopes.

WILDLIFE HABITAT RELATIONSHIPS -- Mixed conifer and hardwood forests provide a diversity of nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins and western redcedar fruit. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap.

Regenerating trees and salmonberry provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Salmonberry, stinkcurrant, and devilsclub provide fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder and salmonberry. Salmonberry flowers also provide nectar for hummingbirds.

These sites may occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The THPL/RUSP/OXOR PC is usually located in areas of gentle topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, western hemlock, and western redcedar, along with salmonberry, oxalis and ferns, provide year-round forage. These sites are probably used year-round by deer, and in late fall to early spring by elk. Nitrogen fixation by alder may improve the quality of forage on these sites.

Many of these sites contribute toward the capability of an area to support beaver, though the stream gradient in a few areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide additional food for beaver. A beaver colony could be supported in the area only if the THPL/RUSP/OXOR PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ADJACENT VEGETATION COMMUNITIES

RIPARIAN -- The THPL/RUSP/OXOR PC was frequently found in association with two closely-related red alder types, the Red Alder/Coltsfoot (ALRU/PEFR2) and Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) plant communities.

UPLAND -- By far the most common upland associate of the THPL/RUSP/OXOR PC was the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) plant association. The Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR) association also occurred, on wetter sites.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The THPL/RUSP/OXOR PC may be confused with the following types, and can be distinguished from them as noted below:

- THPL/ATFI-STCO4 PA - less shrubby; lacks oxalis
- ALRU/OPHO PC - lacks conifers; devilsclub is always dominant; may lack oxalis

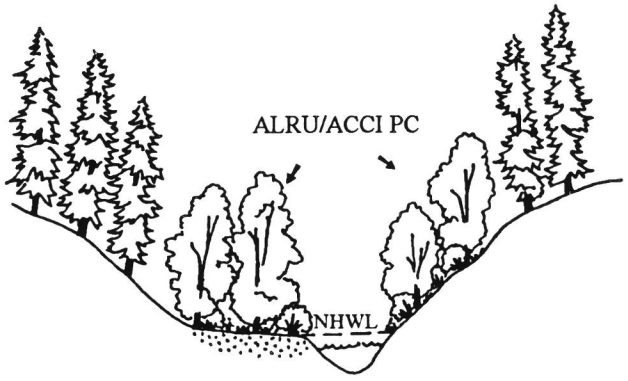
- □ ALRU/OXALIS PC - lacks conifers; salmonberry not as abundant
- □ ALRU/RUSP/OXALIS PC - lacks conifers
- □ ALRU/RUSP/TOME PC - lacks conifers; oxalis not dominant
- □ OPHO PA - lacks trees; devilsclub is dominant
- □ RIBR-RUSP/ATFI PA - lacks trees, oxalis may not be dominant; coarser substrates
- □ OXALIS - lacks tree and shrub components

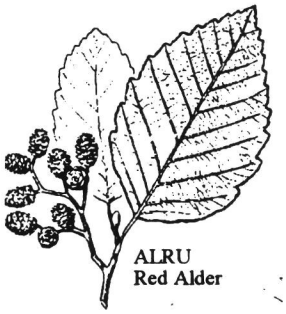
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The THPL/RUSP/OXOR PC has not been described elsewhere in the Pacific Northwest.

ALRU/ACCI PLANT COMMUNITY
Alnus rubra/Acer circinatum
Red Alder/Vinemaple

HAS311

No. Plots = 12



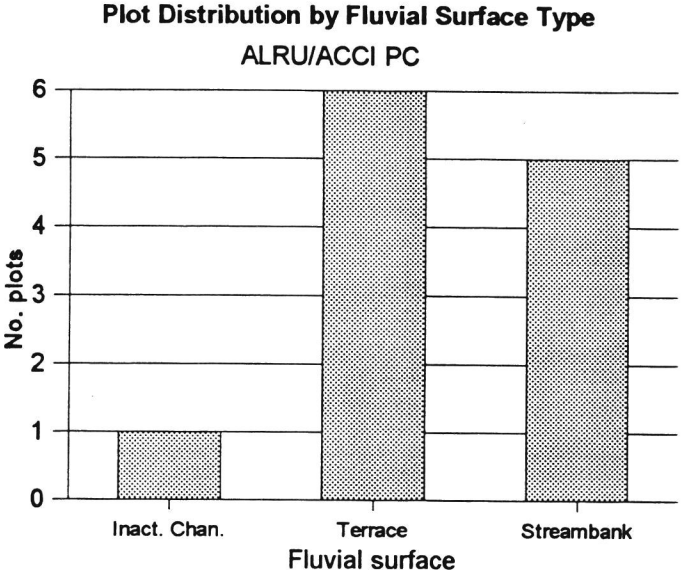


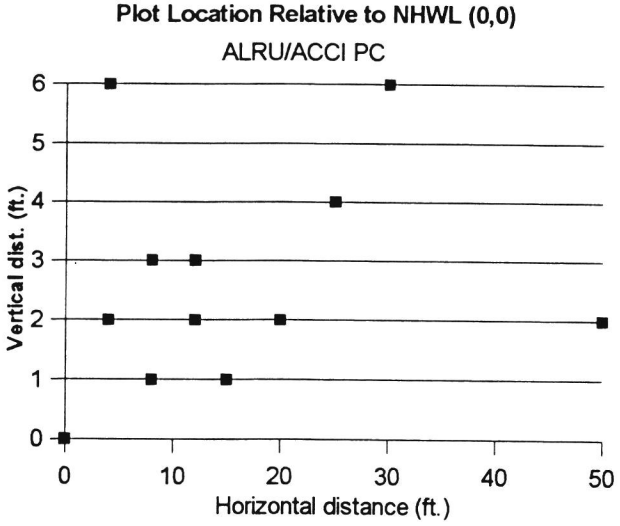
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/ACCI plant community (PC) is a deciduous hardwood forest community with a moderate to dense shrub layer and a sparse to moderate herbaceous understory. In this sample, canopy height averaged 30 to 70 feet in mature stands. Moss cover is variable. The overstory tree layer is dominated by red alder (ALRU). Sparse red alder regeneration may be present in the understory as well. Small amounts of Douglas-fir (PSME), western redcedar (THPL) or grand fir (ABGR) may also be present. Vinemaple (ACCI) dominates the shrub layer, often with canopy cover in the 60% to 80% range. In the herbaceous layer, a variety of moist-site species occurs, but usually in low abundance. Common species are: Siberian miner's lettuce (MOSI), swordfern (POMU), Cooley's hedgenettle (STCO4), ladyfern (ATFI), wall-lettuce (LAMU) and piggyback plant (TOME). An average of 17.8 vascular plant species was found per plot in this sample of the ALRU/ACCI PC, with an average of 4.6 dominants. These are average values for riparian types overall.

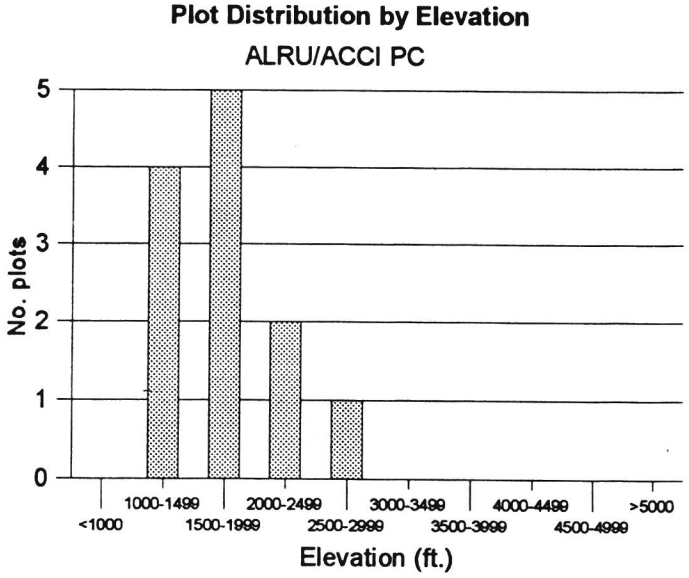
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	92	44
Trees (regen.)			
Alnus rubra	ALRU	33	6
Shrubs			
Acer circinatum	ACCI	100	47
Forbs			
Athyrium filix-femina	ATFI	58	2
Lactuca muralis	LAMU	58	2
Montia sibirica	MOSI	67	12
Oxalis oregana	OXOR	42	7
Polystichum munitum	POMU	75	2
Stachys cooleyae	STCO4	67	4
Tolmiea menziesii	TOME	50	2
Moss		58	11
Bare sand/soil		58	24
Gravel		17	11
Cobbles		25	1
Rock		33	31

ENVIRONMENT AND DISTRIBUTION -- The ALRU/ACCI PC represents relatively warm environments with adequate moisture. It often occurs on fluvial surfaces that experienced intense high flows two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery, with subsequent periods of relatively low intensity inundation.

In this sample of the ALRU/ACCI PC, it occurred on flat to sloping terraces and streambanks within the floodprone zone, generally 1 to 6 feet above and no more than 30 feet away from the normal high-water line, in incised to somewhat alluviated valleys (Rosgen A and B channel types). Substrates were usually deep deposits of sands and silts, or at least 30 cm. of sand/silt over cobbles. Some plots showed evidence of







soil development and incorporation of organic material. The plots were located at lower elevations (mostly below 2000 feet), scattered throughout the portion of the study area west of the Cascade crest.

MANAGEMENT IMPLICATIONS -- In sites that experience intense high flows every few decades, the ALRU/ACCI PC may represent the potential vegetation. In sites with a longer flood return interval (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Topik and others, 1986; Halverson and others, 1986) or Pacific Silver Fir Zone (Hemstrom and other, 1982; Brockway and others, 1983) conifer plant association such as Western Hemlock/Swordfern (TSHE/POMU), Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU), or Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR). The plots in this sample show very little evidence that such succession is occurring, however; only 17% of the plots had conifer regeneration, and always in trace amounts, less than would be expected if

coniferous dominance is expected to develop. The successional status of this type is unclear, and may vary from site to site depending on the local frequency of intense flooding.

The ALRU/ACCI PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, and enhancement of site productivity through nitrogen fixation by red alder. It also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/ACCI PC may also significantly reduce stream velocity during periods of flooding, both causing on-site deposition and reducing downstream effects to landforms and vegetation.

These are sites that may, between infrequent high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amouts of debris and fine-textured alluvium, without significantly disrupting the plant community. When the canopy is opened up, a vigorous response by red alder and vinemaple can be expected. These species are also good candidates for site rehabilitation in this type. Where soil disturbance occurs, there is a risk of finer sediments being transported to the stream, especially on steeper slopes.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. The leaves support a high number of invertebrates which are consumed by many breeding birds. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. Small seed-eating birds and grouse consume red alder buds and catkins.

Vinemaple and some regenerating red alder and conifers provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Vinemaple provides seeds for small mammals and birds.

The ALRU/ACCI PC is often located in areas of flat to moderate topography at low to mid elevations, providing good big game habitat. Regenerating red alder, vinemaple, oxalis and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites contribute toward the capability of an area to support beaver, though the stream gradient in some areas may be too steep for beaver. Red alder provides food and building material for dams. A beaver colony could be supported in the area only if the ALRU/ACCI PC and adjacent red alder and willow-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In this sample, the ALRU/ACCI PC occurred adjacent to a number of riparian plant communities dominated by red alder: Red Alder/Cooley's Hedgenettle (ALRU/STCO4), Red Alder/Thimbleberry (ALRU/RUPA), Red Alder/Coltsfoot (ALRU/PEFR2), Red Alder/Blue Wildrye (ALRU/ELGL), Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI); or by Sitka willow: Sitka Willow (SASI2), Sitka Willow/Coltsfoot (SASI2/PEFR2).

UPLAND -- The ALRU/ACCI PC was primarily found in conjunction with Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) plant associations that indicate warm, moist, productive environments: Western Hemlock/Swordfern (TSHE/POMU), Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) and Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/ACCI PC may be confused with the following types, and can be distinguished from them as noted below:

- ALRU/OPHO PC - devilsclub is always dominant; occurs in wetter sites
- ALRU/OXALIS PC - lacks vinemaple; oxalis is always abundant
- ALRU/RUSP/OXALIS PC - has a dominance of stinkcurrant and salmonberry; moister sites
- THPL/RUSP/OXOR PC - "
- ALRU/RUSP/TOME PC - "
- ALRU/STCO4 PC - lacks vinemaple
- ALRU/TOME-MOSI PC - vinemaple may be present, but not dominant
- ACCI/STCO4 PA - lacks red alder

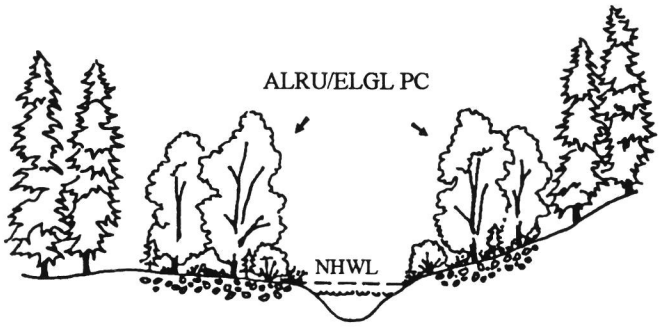
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/ACCI PC has not been described elsewhere in the Pacific Northwest.

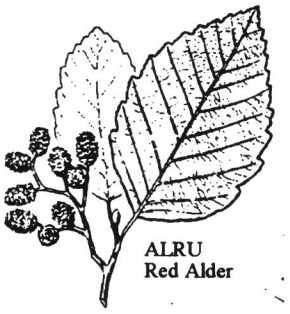
ALRU/ELGL PLANT COMMUNITY **HAF211**

Alnus rubra/Elymus glauca

Red Alder/Blue Wildrye

No. Plots = 15





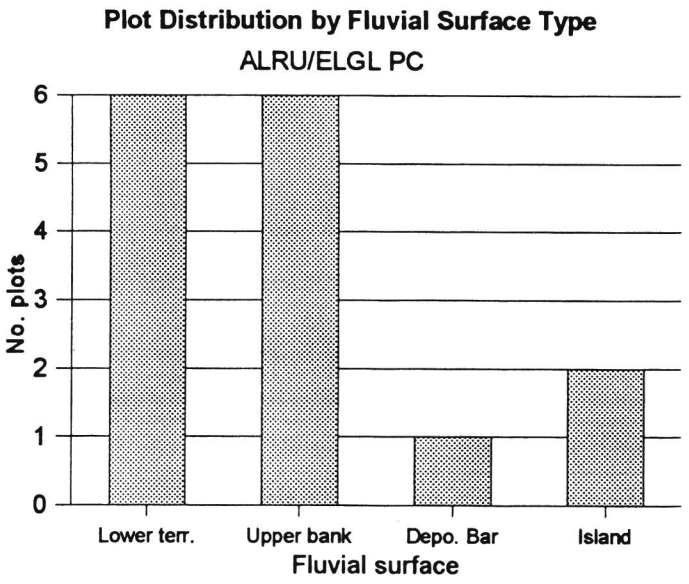
ELGL
Blue Wildrye

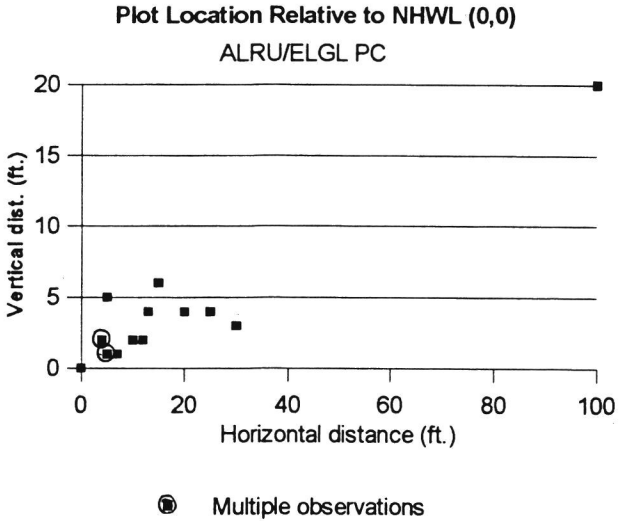
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/ELGL plant community (PC) is a deciduous hardwood forest community that has a grassy understory with scattered tall shrubs and forbs. Canopy height in this sample was generally between 30 and 50 feet in mature stands, but occasionally reached 100 feet. Moss cover varies. The overstory is dominated by red alder (ALRU), which may also be found reproducing abundantly. Small amounts of bigleaf maple (ACMA) or Douglas-fir (PSME) may also be found reproducing. The shrub layer generally consists of low to moderate amounts of salmonberry (RUSP), and trailing blackberry (RUUR) is common. Blue wildrye (ELGL) dominates the herbaceous layer, and is usually accompanied by lesser amounts of wall-lettuce (LAMU), swordfern (POMU) or Siberian miner's lettuce (MOSI). An average of 19.3 vascular plant species was found per plot in this sample of the ALRU/ELGL PC, with an average of 3.7 dominant species. This represents average total diversity when compared with riparian types overall, but lower-than-average dominance, reflecting the predominance of red alder and blue wildrye over other species.

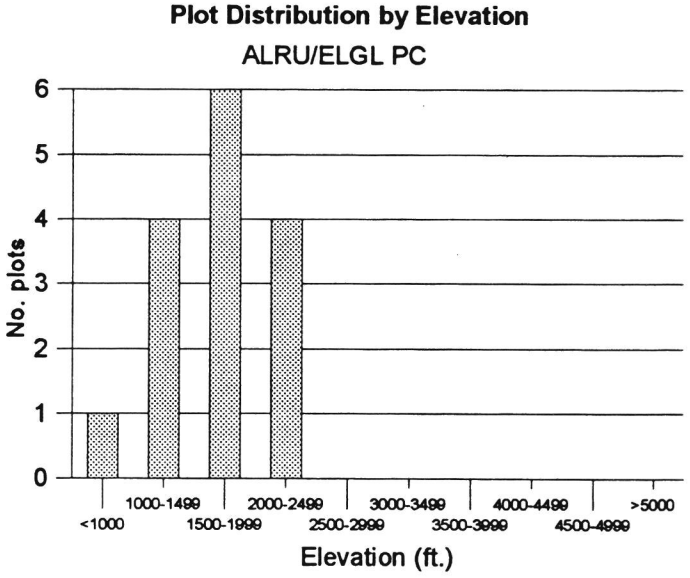
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	87	61
Trees (regen.)			
Acer macrophyllum	ACMA	53	1
Alnus rubra	ALRU	33	48
Pseudotsuga menziesii	PSME	53	4
Shrubs			
Rubus spectabilis	RUSP	60	3
Rubus ursinus	RUUR	67	8
Forbs			
Lactuca muralis	LAMU	87	3
Montia sibirica	MOSI	73	9
Polystichum munitum	POMU	80	4
Grasses/grasslikes			
Elymus glaucus	ELGL	100	33
Moss		33	24
Bare sand/soil		33	6
Gravel		7	20
Cobbles		60	19
Rock		47	18

ENVIRONMENT AND DISTRIBUTION -- The ALRU/ELGL PC represents warm, dry riparian environments with a relatively long growing season and coarse substrates. It often occurs on fluvial surfaces that were subjected to intense high flows and alluvial deposition (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample of the ALRU/ELGL PC, it was found on flat (occasionally sloping) streambanks and terraces in the floodprone zone of wider alluviated valleys (Rosgen C (occasionally B) channel types), with floodplain widths often in excess of 100 feet. Plots were generally located 1 to 6 feet above the







normal high-water line, and 1 to 35 feet away. Substrates were most often a mix of gravel and cobbles, sometimes with a few cm. of sand at the surface. Organic matter was generally low, and there was significant unvegetated ground on most plots. This type was sampled in widely varied locations on the portion of the study area west of the Cascade crest, at lower elevations (less than 2300 feet).

MANAGEMENT IMPLICATIONS -- The ALRU/ELGL PC may represent the potential vegetation in sites that experience intense high flows and deposition of coarse alluvium every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the flood events of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Topik and others, 1986; Halverson and others, 1986)conifer plant association. The plots in this sample show some evidence that such succession is occurring; more than half of the plots had conifer regeneration (usually in trace amounts). However, the understory lacks clues as to what the eventual "endpoint" plant association is

likely to be. The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/ELGL PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. The soil-building functions of nitrogen fixation and organic matter accumulation are very important in these sites with coarse, dry substrates. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/ELGL PC may also significantly reduce stream velocity during periods of flooding, both causing on-site deposition and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amouts of debris and fine-textured alluvium, and not disrupt the plant community significantly. When the canopy is opened up, a vigorous response by red alder and shrubs like Sitka willow (SASI2), prickly currant (RIBR) and vinemaple (ACCI) is likely. These species are also good candidates for site rehabilitation in this type, as is blue wildrye. Because the soils are extremely coarse and dry, inadequate moisture may inhibit plant establishment and growth.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. In the oldest stands, snags may be available that are large enough for cavity nesters such as sapsuckers, woodpeckers, and chickadees.

Regenerating red alder, bigleaf maple, and Douglas-fir, along with scattered shrubs, provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Bigleaf maple, salmonberry, and trailing blackberry provide seeds and fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder and salmonberry. Salmonberry flowers also provide nectar for hummingbirds.

The ALRU/ELGL PC is usually located in areas of flat to gentle topography at low elevations, providing good big game habitat. Regenerating red alder, salmonberry, trailing blackberry and sword fern provide year-round forage. However, hiding cover is limiting during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites contribute toward the capability of an area to support beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide additional food for beaver. A beaver colony could be supported in the area only if the ALRU/ELGL PC and adjacent red alder and willow-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/ELGL PC in this sample was located adjacent to a variety of riparian types

characteristic of lower elevations. The most common were the Red Alder/Thimbleberry (ALRU/RUPA), Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI), Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI), Sitka Willow (SASI2) and Western Redcedar/Ladyfern-Hedgenettle (THPL/ATFI-STCO4) types.

UPLAND -- Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) plant associations characteristic of warmer sites were frequently associated with the ALRU/ELGL PC in this sample. The most common was the Western Hemlock/Swordfern (TSHE/POMU) association, followed by the Western Hemlock/Dwarf Oregongrape-Salal (TSHE/BENE-GASH) and Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/ELGL PC may be confused with the following types, and can be distinguished from them as noted below:

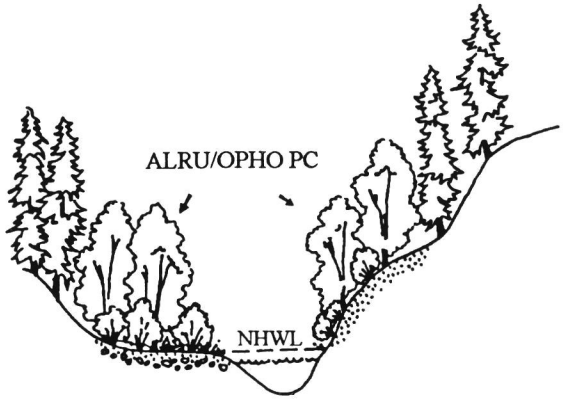
- □ ALRU (Shrub) PC - more often within bankfull zone; blue wildrye may be present but is not dominant
- □ SASI2 PC - Sitka willow is dominant; blue wildrye may be present but is not dominant

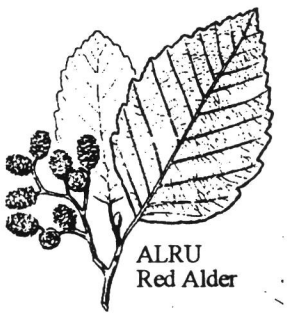
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/ELGL PC has not been described elsewhere in the Pacific Northwest.

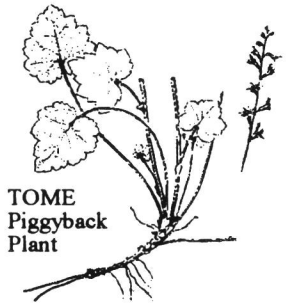
ALRU/OPHO PLANT COMMUNITY
Alnus rubra/Oplopanax horridum
Red Alder/Devilsclub

HAS411

No. Plots = 12







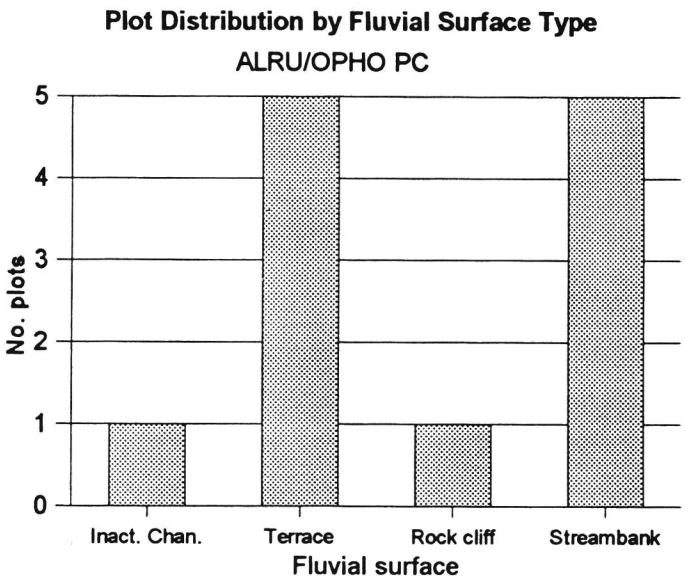
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/OPHO plant community (PC) is a hardwood forest community with a well developed tall shrub layer and a lush carpet of forbs. The canopy in this sample varied from open (20% cover) to closed. Canopy height usually ranged between 20 and 60 feet, but occasionally exceeded 100 feet. Moss cover is variable. The overstory is dominated by red alder (ALRU), occasionally in association with western hemlock (TSHE). Small amounts of red alder and western hemlock reproduction may be found. The shrub layer is dominated by devilsclub (OPHO), often along with stinkcurrant (RIBR), vinemaple (ACCI) and salmonberry (RUSP). A variety of moist-site species is present in the forb layer, including piggyback plant (TOME), ladyfern (ATFI), oxalis (OXOR) and others. There was an average of 18.7 vascular plant species per plot in this sample of the ALRU/OPHO PC, with an average of 5.7 dominant species. These are average values compared to riparian types overall.

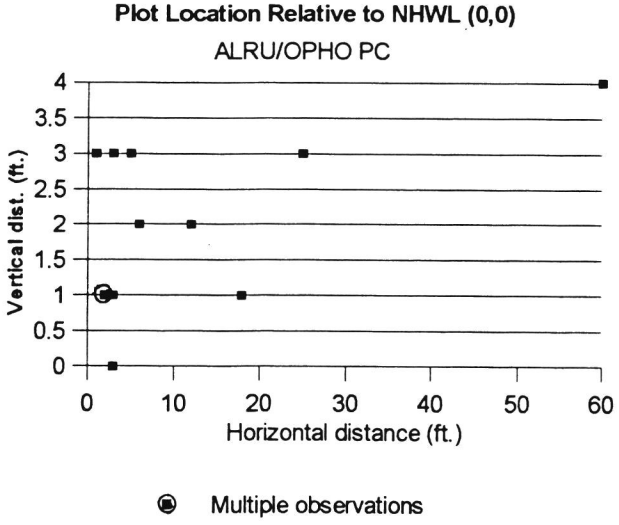
ENVIRONMENT AND DISTRIBUTION -- The ALRU/OPHO PC represents warm to cool,

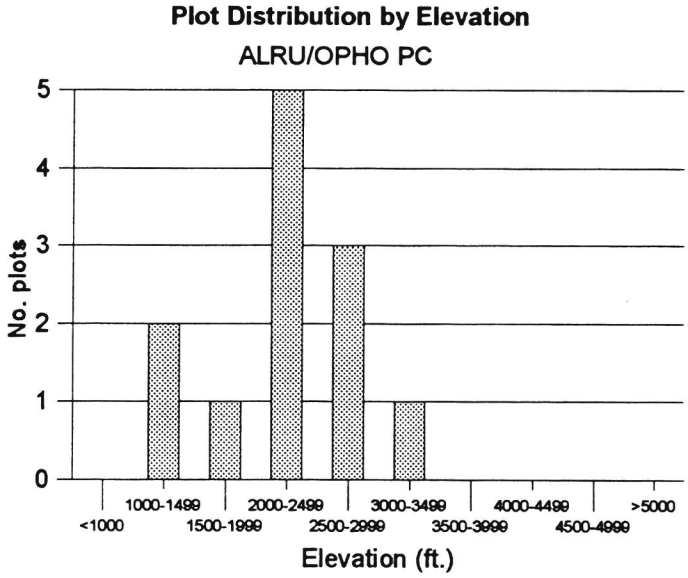
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	100	43
Trees (regen.)			
Alnus rubra	ALRU	33	2
Shrubs			
Acer circinatum	ACCI	42	27
Oplopanax horridum	OPHO	100	31
Ribes bracteosum	RIBR	75	19
Rubus spectabilis	RUSP	75	6
Forbs			
Athyrium filix-femina	ATFI	58	5
Dicentra formosa	DIFO	50	2
Montia sibirica	MOSI	50	2
Oxalis oregana	OXOR	50	18
Polystichum munitum	POMU	50	4
Stachys cooleyae	STCO4	42	3
Tolmiea menziesii	TOME	58	19
Moss		50	20
Bare sand/soil		50	15
Gravel		17	3
Cobbles		25	29
Rock		42	34

productive, wet riparian sites. It often occurs on fluvial surfaces that experienced high flows and deposition of alluvial silt and sand two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, it was found on both sloping streambanks and flat terraces within the floodprone zone of narrow to wide alluviated valleys or (less commonly) incised to slope-bound valleys (Rosgen C or, less commonly, B, channel types). It generally occurred 1 to 3 feet above, and 1 to 25 feet away from the normal high-water line. The most common substrate was a mixture of silt and sand, followed by a layer of sand (10-30 cm.) over cobbles, suggesting that the most recent inundations have been relatively







low intensity flows. Soils where the ALRU/OPHO PC occurs are typically saturated year-round and high in organic matter. On steeper slopes, the presence of the ALRU/OPHO PC may be not so much the result of contact with high flows, but due to surface instability and wet soils that preclude conifer establishment.

The ALRU/OPHO PC in the sample was found throughout the study area west of the Cascade crest, mostly below 2700 feet in elevation, but occasionally slightly above 3000 feet. A similar plant community has been observed farther south in the Cascades of Oregon, but environmental and successional parallels to this type have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/OPHO PC may represent the potential vegetation in riparian sites with a high water table that experience high flows every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the high intensity flows of 1964

and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Topik and others, 1986; Halverson and others, 1986) conifer plant association such as Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR)or Western Hemlock/Devilsclub/Swordfern (TSHE/OPHO/POMU). The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/OPHO PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/OPHO PC may also significantly reduce stream velocity during periods of flooding, both causing on-site deposition and reducing downstream effects to landforms and vegetation.

When the canopy is opened up, a vigorous response by red alder and shrubs like devilsclub, salmonberry, vinemaple and stinkcurrant is likely. These species are also good candidates for site rehabilitation in this type. The fine-textured, highly organic soils in this type may be prone to compaction by heavy equipment. Channelization of ground water, erosion and sedimentation are risks where the ground surface is disturbed, especially on steeper slopes.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. In the oldest stands, snags may be available that are large enough for cavity nesters such as sapsuckers, woodpeckers, and chickadees.

Vinemaple, salmonberry, and some regenerating red alder and western hemlock provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Vinemaple, devilsclub, salmonberry, and stinkcurrant provide fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of alder and salmonberry. Salmonberry flowers also provide nectar for hummingbirds.

The ALRU/OPHO PC is often located in areas of flat topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, vinemaple, salmonberry, oxalis and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites may be capable of supporting beaver, though the stream gradient in some areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide some additional food for beaver. A beaver colony could be supported in the area only if the ALRU/OPHO PC is extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/OPHO PC was most frequently found adjacent to riparian communities indicative

of wet, productive environments. The most common were the Devilsclub (OPHO) and Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) types.

UPLAND -- Upland plant associations found in conjunction with the ALRU/OPHO PC were usually Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) types characteristic of moist, productive environments, most commonly the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR), Western Hemlock/Alaska Huckleberry/Oxalis (TSHE/VAAL/OXOR), Western Hemlock/Devilsclub/Swordfern (TSHE/OPHO/POMU), and Western Hemlock/Devilsclub/Oregon (TSHE/OPHO/OXOR) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/OPHO PC may be confused with the following types, and can be distinguished from them as noted below:

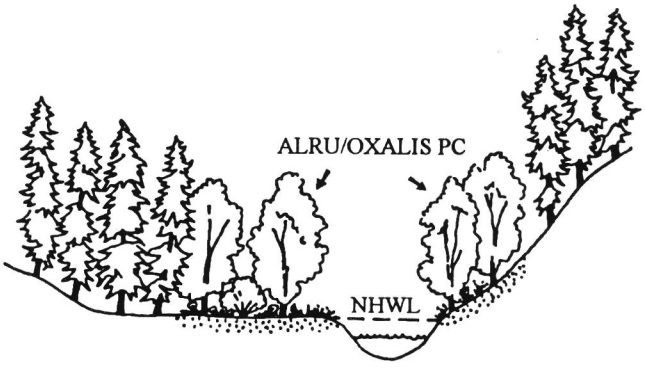
- □ THPL/RUSP/OXALIS PC - conifers are dominant; lacks devilsclub
- □ ALRU/ACCI PC - devilsclub may be present but not dominant; drier sites
- □ ALRU/OXALIS PC - "
- □ ALRU/RUSP/OXALIS PC - salmonberry is dominant; lacks devilsclub
- □ OPHO PA - lacks red alder; herb layer is very similar
- □ RIBR-RUSP/ATFI PA - lacks red alder and devilsclub; herb layer is very similar
- □ OXALIS PA - "
- □ STCO4-ATFI PA - "
- □ STCO4-MIGU PA - "

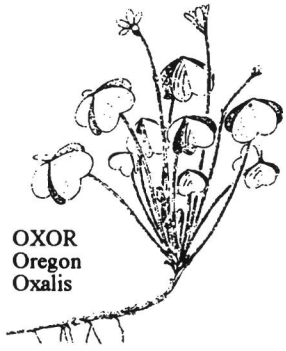
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/OPHO PC has not been described elsewhere in the Pacific Northwest.

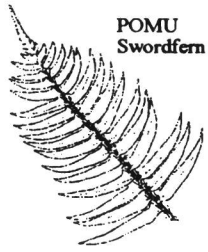
ALRU/OXALIS PLANT COMMUNITY
Alnus rubra/Oxalis spp.
Red alder/Oxalis

No. Plots = 14

HAF222





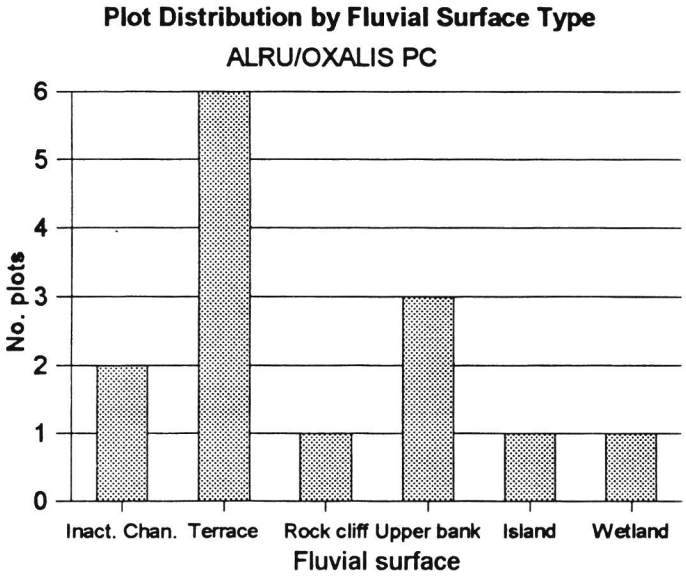


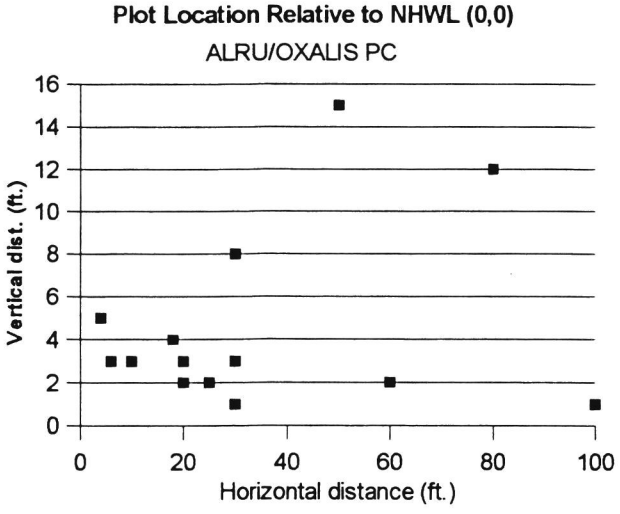
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/OXALIS plant community (PC) is a closed-canopy deciduous hardwood forest type with sparse tall shrubs and a well-developed, diverse forb layer. In this sample, canopy height ranged between about 35 and 65 feet in mature stands. Moss cover is variable, often very high. The overstory is dominated by red alder (ALRU), sometimes in association with bigleaf maple (ACMA). Tree regeneration is rather uncommon and low in abundance, and consists mainly of red alder and western hemlock (TSHE) or western redcedar (THPL). The shrub layer often has scattered salmonberry (RUSP) or red elderberry (SARA), along with trailing blackberry (RUUR). The forb layer is dominated by oxalis (OXOR and OXTR), swordfern (POMU) and ladyfern (ATFI), commonly in association with Siberian miner's lettuce (MOSI) and piggyback plant (TOME). In this sample of the ALRU/OXALIS PC there was an average of 17.8 vascular plant species per plot, with an average of 4.9 dominant species. These are average values compared to riparian types overall.

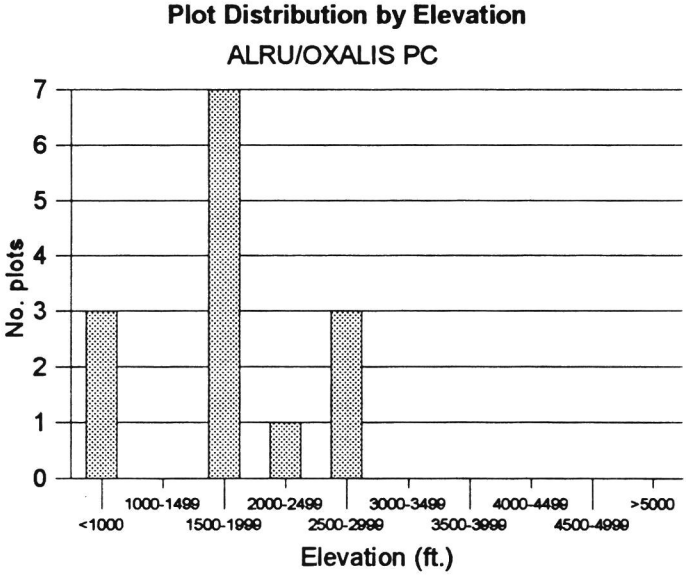
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	71	59
Trees (regen.)			
Alnus rubra	ALRU	29	13
Tsuga heterophylla	TSHE	36	5
Shrubs			
Rubus spectabilis	RUSP	57	2
Rubus ursinus	RUUR	43	14
Forbs			
Athyrium filix-femina	ATFI	71	11
Montia sibirica	MOSI	79	2
Oxalis oregana	OXOR	71	28
Oxalis trilliifolia	OXTR	29	31
Polystichum munitum	POMU	86	15
Tolmiea menziesii	TOME	50	10
Moss		43	46
Bare sand/soil		50	7
Gravel		14	1
Cobbles		7	4
Rock		43	28

ENVIRONMENT AND DISTRIBUTION -- The ALRU/OXALIS PC represents moist, productive riparian sites with a relatively long growing season. It often occurs on fluvial surfaces that experienced high flows and deposition of alluvial silts and sands two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample it occurred on flat (rarely sloping) terraces and streambanks within the floodprone zone of generally wide (150 feet or wider) alluviated valleys (Rosgen C channel type), or (rarely) somewhat alluviated incised channels (Rosgen B channel type). Plots were primarily 1 to 5 feet above the normal high-water line, and within 40 feet horizontal distance. Substrates were typically deep sand-silt combinations,







or several cm. of sands or silts over gravel (rarely cobbles), suggesting the most recent inundations have been low intensity flows. Soils tended to have significant organic matter in the profile. The plant species present indicate the soils are moist but adequately drained. A few of the plots in this type had high cover (>50%) of bare rock. The ALRU/OXALIS PC was found in streams throughout the study area west of the Cascade crest, mostly below 2000 feet but occasionally between 2000 and 3000 feet in elevation. A similar community has been observed farther south in the Cascades on the Willamette National Forest, but environmental and successional parallels have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/OXALIS PC may represent the potential vegetation in sites that experience high intensity flooding every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the high flows of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986)

conifer plant association such as Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR). The plots in this sample show some evidence that such succession is occurring; roughly a third of the plots had conifer regeneration (however, usually only in trace amounts). The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/OXALIS PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/OXALIS PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of fluvial surfaces, and reducing downstream effects to landforms and vegetation.

When the canopy is opened up, a vigorous response by red alder, and possibly ladyfern and swordfern, is likely. These species are also good candidates for site rehabilitation in this type. Where soil disturbance occurs, there is a risk of sedimentation.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. The leaves support a high number of invertebrates that are consumed by many breeding birds. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. Small seed-eating birds and grouse consume red alder buds and catkins.

Red alder and conifer seedlings are sparse, but along with scattered salmonberry they provide some nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Rock provides cover for small mammals and amphibians. Scattered salmonberry, trailing blackberry, red elderberry, and redcedar provide some fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder and salmonberry. Salmonberry and elderberry flowers also provide nectar for hummingbirds.

These sites may occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ALRU/OXALIS PC is usually located in areas of flat topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, western hemlock, western redcedar, and salmonberry and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites contribute toward the capability of an area to support beaver, though the stream gradient in a few areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide some additional food for beaver. A beaver colony could be supported in the area only if the ALRU/OXAL PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- Herb-rich riparian types representative of moist, productive habitats were commonly found in conjunction with the ALRU/OXALIS PC. Examples are the Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) and Red Alder/Salmonberry/Oxalis (ALRU/RUSP/OXALIS) types. Other common associates were the Coltsfoot (PEFR2), Red alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) and Red Alder/Coltsfoot (ALRU/PEFR2) types.

UPLAND -- The Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) plant association (Halverson and others, 1986) was by far the most common upland type found adjacent to the ALRU/OXOR PC. Other common associates include the Western Hemlock/Swordfern (TSHE/POMU) and Western Hemlock/Devilsclub/Swordfern (TSHE/OPHO/POMU) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/OXALIS PC may be confused with the following types, and can be distinguished from them as noted below:

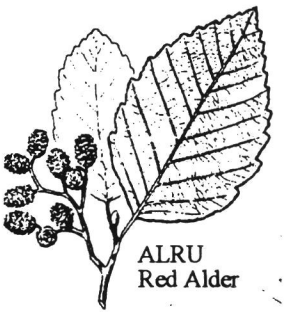
- THPL/RUSP/OXALIS PC - is dominated by conifers; shrub layer is well-developed
- ALRU/ACCI PC - is dominated by vinemaple; shrub layer is well-developed
- ALRU/OPHO PC - is dominated by devilsclub; shrub layer is well-developed
- ALRU/PEFR2 PC - herb layer is dominated by coltsfoot; generally lacks oxalis
- ALRU/RUSP/OXALIS PC - shrub layer well-developed, dominated by salmonberry and stinkcurrant
- ALRU/RUSP/TOME PC - shrub layer well-developed, dominated by salmonberry and stinkcurrant; oxalis may be present but does not dominate herb layer
- ALRU/TOME-MOSI PC - generally lacks oxalis
- RIBR-RUSP/ATFI PA- lacks red alder; shrub layer well-developed and dominated by salmonberry and stinkcurrant
- OPHO PA - lacks red alder; shrub layer well-developed and dominated by devilsclub
- OXALIS PA - lacks red alder

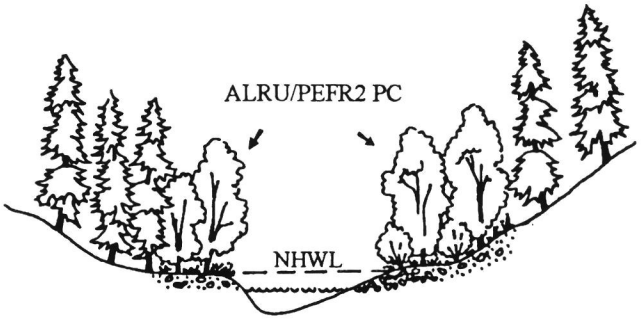
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/OXALIS PC has not been described elsewhere in the Pacific Northwest.

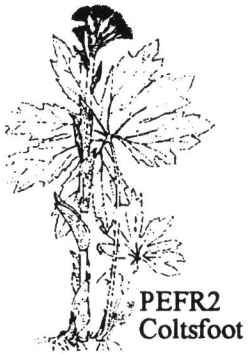
ALRU/PEFR2 PLANT COMMUNITY
Alnus rubra/Petasites frigidus
Red Alder/Coltsfoot

HAF223

No. Plots = 25







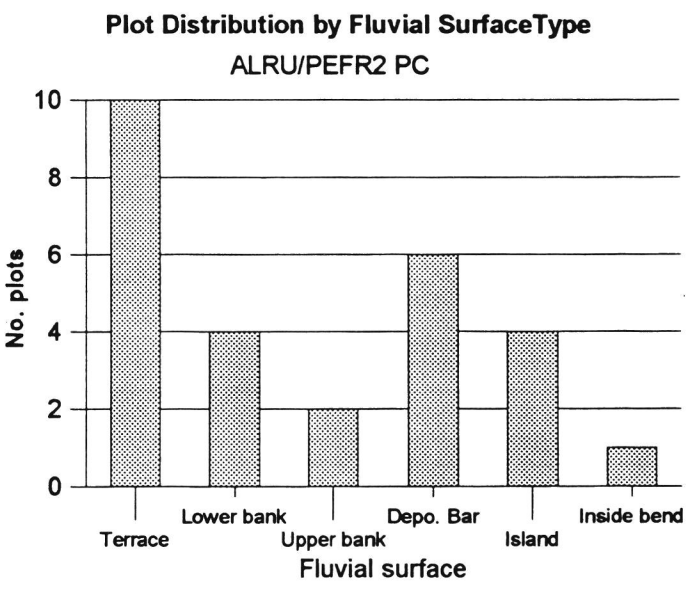
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/PEFR2 plant community (PC) is a deciduous hardwood forest community with a sparse shrub tall shrub layer and a relatively well-developed forb layer. In this sample, mature stands tended to have a closed canopy; the oldest ranged in height between 40 and 80 feet. Earlier successional stages were also commonly encountered, with a similar species composition but canopy heights of 4 to 20 feet. Moss cover in this type is usually low to moderate. The overstory is dominated by red alder (ALRU), which may also be found reproducing in the understory of older stands. Traces of western hemlock (TSHE), western redcedar (THPL), Douglas-fir (PSME) or Pacific silver fir (ABAM) may be present. A small amount of salmonberry (RUSP) is commonly found in the shrub layer. The forb layer is dominated by coltsfoot (PEFR2), which may be accompanied by ladyfern (ATFI), piggyback plant (TOME), Cooley's hedgenettle (STCO4) or Siberian miner's lettuce (MOSI). There was an average of 18.9 vascular plant species per plot in this sample of the ALRU/PEFR2 PC, with an average of 4.6 dominant species. These

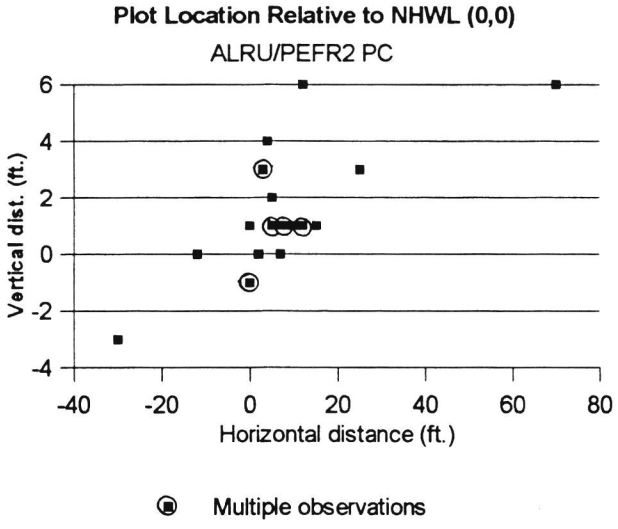
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	68	45
Trees (regen.)			
Alnus rubra	ALRU	68	23
Shrubs			
Rubus spectabilis	RUSP	64	3
Forbs			
Athyrium filix-femina	ATFI	64	9
Montia sibirica	MOSI	52	4
Petasites frigidus	PEFR2	100	24
Stachys cooleyae	STCO4	64	6
Tolmiea menziesii	TOME	64	7
Moss		64	22
Bare sand/soil		52	14
Gravel		56	7
Cobbles		64	18
Rock		36	30

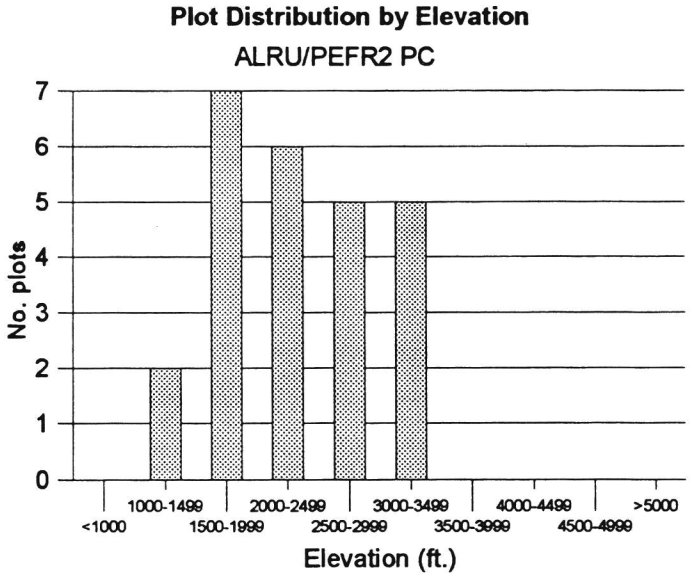
are average values for riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/PEFR2 PC represents wet riparian sites with coarse alluvial deposits low in organic matter, that have been subjected to high flows within the last two to several decades (for example, during the storms of 1964 or the 1970s), and possibly to less-intense inundation subsequently.

In this sample of the ALRU/PEFR2 PC, it occurred on relatively flat surfaces on a variety of landforms, primarily terraces, streambanks and depositional bars or islands, both within the bankfull and floodprone zones of alluviated valleys (Rosgen B and C channel types) of







varying widths. Plots were located from 3 feet below to 5 feet above and generally within 6 lateral feet of the normal high-water line. Substrates were most often mixes of sands and gravels or gravels and cobbles, often showing only a single or at most two distinct layers. This suggests the alluvium on many of these surfaces was deposited during a single intense high flow event. The substrates in this sample evidenced little soil organic matter or presence of surface litter. Most plots had significant bare sand or rock. The species present indicate available moisture in the rooting zone throughout the growing season, although the surface layers are frequently very dry. The ALRU/PEFR2 PC was located throughout the study area on the west side of the Cascade crest, primarily below 3500 feet in elevation. A similar community has been observed farther south in the Cascades on the Willamette National Forest, but environmental and successional parallels have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/PEFR2 PC probably represents the potential vegetation

when it occurs within the bankfull zone. In the floodprone zone, it *may* represent the potential vegetation in sites that experience high intensity flooding every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) or Pacific Silver Fir Zone (Hemstrom and other, 1982; Brockway and others, 1983) conifer plant association. Some of the plots in this sample show an indication of such succession, by the presence of conifer regeneration (usually in trace amounts). However, the understory lacks clues as to what the eventual "endpoint" plant association is likely to be. The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/PEFR2 PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. The soil-building functions of nitrogen fixation and organic matter accumulation are very important in these sites with coarse substrates and negligible soil development. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/PEFR2 PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surfaces, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium, without significantly disrupting the plant community. When the canopy is opened up or the ground in disturbed, a vigorous response by red alder is likely. Red alder is probably the best candidate for site rehabilitation in this type; Sitka willow (SASI2) may also be a possibility. The coarseness of the substrate may inhibit plant establishment and growth, even though moisture is generally abundant.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. The leaves support a high number of invertebrates that are consumed by many breeding birds. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. Small seed-eating birds and grouse consume red alder buds and catkins.

Regenerating red alder and conifers, along with scattered salmonberry, provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Rock provides cover for small mammals and amphibians. Scattered salmonberry and redcedar provide some fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of salmonberry and red alder. Salmonberry flowers also provide nectar for hummingbirds.

Some of the sites were on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ALRU/PEFR2 PC is usually located in areas of flat topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, salmonberry and lady fern provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites contribute toward the capability of an area to support beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide some additional food for beaver. A beaver colony could be supported in the area only if the ALRU/PEFR2 PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/PEFR2 PC occurred adjacent to a wide variety of riparian communities in this sample. It was most frequently associated with other moist-site red alder types, primarily the Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) and Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI) types. It also occurred adjacent to the Vinemaple/Cooley's Hedgenettle (ACCI/STCO4), Sitka Willow (SASI2) and Coltsfoot (PEFR2) types.

UPLAND -- The ALRU/PEFR2 PC was found associated with several different Western Hemlock Zone and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations. The most common were the Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU), Western Hemlock/Swordfern (TSHE/POMU), Western Hemlock/Dwarf Oregongrape-Salal (TSHE/BENE-GASH) and Western Hemlock/Alaska Huckleberry/Bunchberry Dogwood (TSHE/VAAL/COCA) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/PEFR2 PC may be confused with the following types, and can be distinguished from them as noted below:

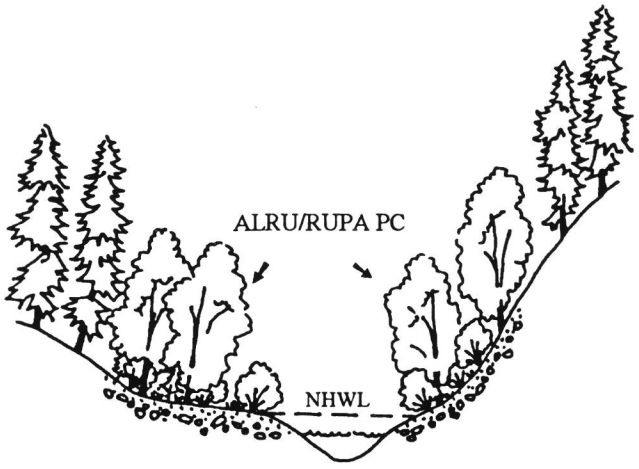
- ALRU/STCO4 PC - herb layer is not dominated by coltsfoot
- ALRU/TOME-MOSI PC - "
- THPL/ATFI-STCO4 PA- conifers are dominant; coltsfoot may occur, but is not dominant
- RIBR-RUSP/PEFR2 PA - dominated by salmonberry and stinkcurrant; red alder is not dominant; less likely to occur in bankfull zone
- SASI2/PEFR2 PC - dominated by Sitka willow
- PEFR2 PC - low abundance of red alder

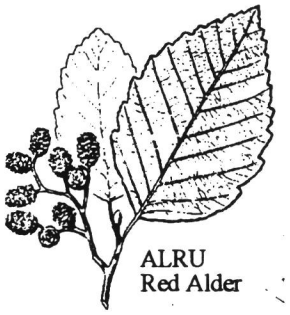
RELATIONSHIP TO OTHER CLASSIFICATIONS -- A Red Alder/Coltsfoot community type has been described for eastern Oregon (Crowe and Clausnitzer, 1996) which is similar with regard to dominant vegetation, but has very different associated plant species.

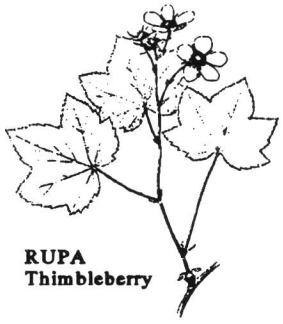
ALRU/RUPA PLANT COMMUNITY **HAS111**

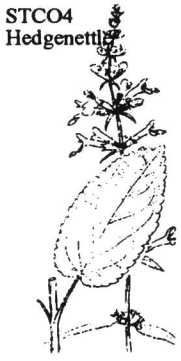
Alnus rubra/Rubus parviflorus
Red Alder/Thimbleberry

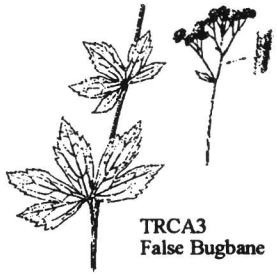
No. Plots = 9











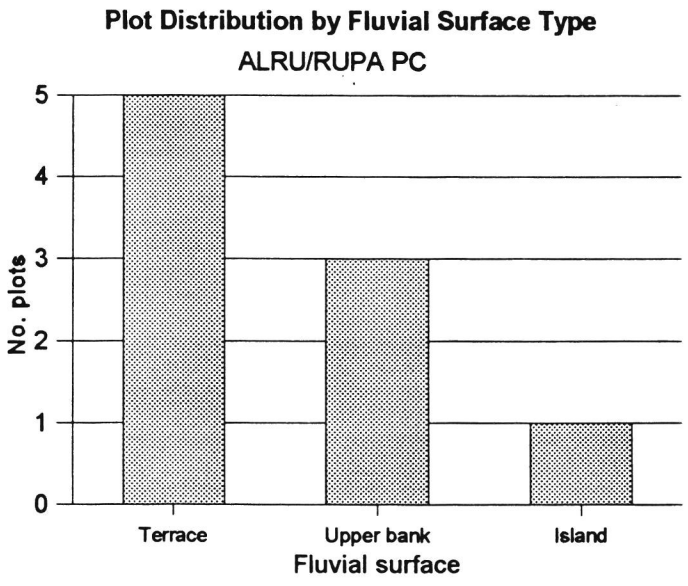
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/RUPA plant community (PC) is a deciduous hardwood forest community with well-developed low shrub and forb layers. In this sample, the canopy in older stands tended to be closed, and variable in height (ranged from 30 to 90 feet). Moss cover in this type is usually low. The overstory is dominated by red alder (ALRU), which may also be reproducing in the understory. More commonly, however, conifer seedlings are present in the regeneration layer, primarily western redcedar (THPL), western hemlock (TSHE) or Douglas-fir (PSME). The shrub layer is dominated by thimbleberry (RUPA), often in association with small amounts of salmonberry (RUSP). In the herbaceous layer, Cooley's hedgenettle (STCO4) is generally the dominant species, frequently along with false bugbane (TRCA3), piggyback plant (TOME), cow parsnip (HELA) or Siberian miner's lettuce (MOSI). There was an average of 19.8 vascular plant species per plot in this sample of the ALRU/RUPA PC, with an average of 4.4 dominant species. This relatively high total species diversity compared to riparian types

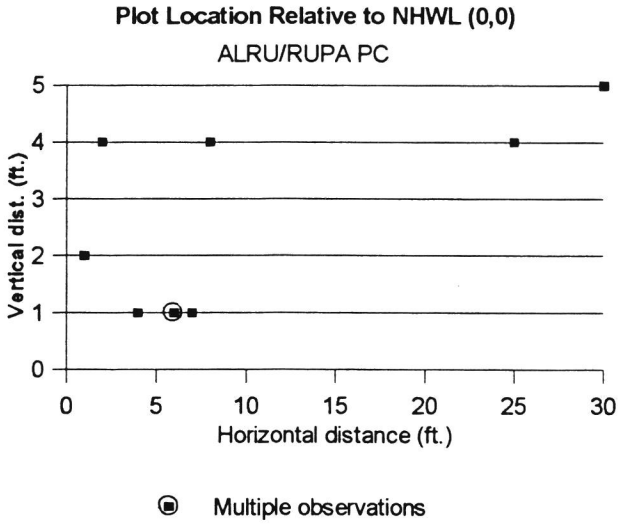
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	78	61
Trees (regen.)			
Alnus rubra	ALRU	33	27
Thuja plicata	THPL	56	1
Shrubs			
Rubus parviflorus	RUPA	100	39
Rubus spectabilis	RUSP	67	4
Forbs			
Heracleum lanatum	HELA	44	4
Montia sibirica	MOSI	44	3
Stachys cooleyae	STCO4	67	11
Tolmiea menziesii	TOME	44	4
Trautvetteria carolin.	TRCA3	56	2
Moss		56	28
Bare sand/soil		78	15
Gravel		22	6
Cobbles		11	5
Rock		11	14

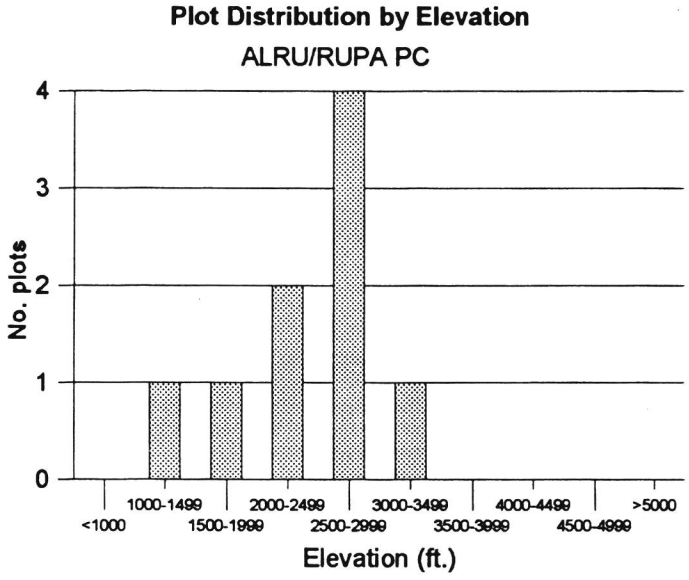
overall, but only average dominance, reflecting the predominance within the plant community of just a few species.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/RUPA PC represents moderately warm, moist, well-drained sites. It often occurs on fluvial surfaces that experienced intense high flows two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, it occurred on flat to steeply sloping streambanks and terraces 1 to 5 feet above and up to 30 feet away from the normal high-water line, in the floodprone zone of incised to alluviated valleys







(Rosgen B and C channel types) of varying widths. The substrate was normally a layer of sand or silt several cm. thick over gravel or cobbles, suggesting one or more periods of low intensity inundation since the flood event that initiated vegetation succession. Organic matter was not abundant. The plant species present indicate the rooting zone remains moist during the growing season. Plots in this type were located at moderate elevations, mostly in the portion north of the Columbia River and west of the Cascade crest; only two locations were found south of the Columbia River, one on each side of the Cascade crest. A similar community has been observed farther south in the Cascades of Oregon, on the Willamette National Forest, but environmental and successional parallels have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/RUPA PC may represent the potential vegetation in sites that experience high intensity flows every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a

successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) or Pacific Silver Fir Zone (Hemstrom and other, 1982; Brockway and others, 1983) conifer plant association, or of the riparian Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4) association. The plots in this sample show some evidence that such succession is occurring; more than half of the plots had conifer regeneration (usually in trace amounts). The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/RUPA PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/RUPA PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surfaces, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium, without significantly disrupting the plant community. When the canopy is opened up, a vigorous response by red alder, thimbleberry and salmonberry is likely. These species are also good candidates for site rehabilitation in this type. On steeper slopes, ground disturbance carries a risk of sedimentation.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. The leaves support a high number of invertebrates that are consumed by many breeding birds. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. Small seed-eating birds and grouse consume red alder buds and catkins.

Regenerating red alder and conifers, along with salmonberry and thimbleberry, provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Salmonberry, thimbleberry, and redcedar provide fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of salmonberry, thimbleberry, and red alder. Salmonberry flowers also provide nectar for hummingbirds.

These sites may occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

Where the ALRU/RUPA PC occurs on flat terraces at low elevations the sites provide wintering areas for big game. Regenerating conifers provide some cover. Western hemlock, western redcedar, and salmonberry provide winter browse. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

Many of these sites contribute toward the capability of an area to support beaver, though the stream gradient in a few areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry and thimbleberry provide additional food for beaver. A beaver colony could be supported in the area only if the ALRU/RUPA PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/RUPA PC was commonly found in association with other red alder types, primarily the Red Alder/Coltsfoot (ALRU/PEFR2) and Red Alder/Vinemaple (ALRU/ACCI) communities. A wide variety of other mid-elevation riparian types could also occur alongside the ALRU/RUPA PC.

UPLAND -- The Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) was the most common upland associate of the ALRU/RUPA PC in this sample. A variety of other Western Hemlock Zone, Pacific Silver Fir Zone and eastern Cascades (Topik and others, 1988) plant associations were also found in conjunction with the ALRU/RUPA PC.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/RUPA PC may be confused with the following types, and can be distinguished from them as noted below:

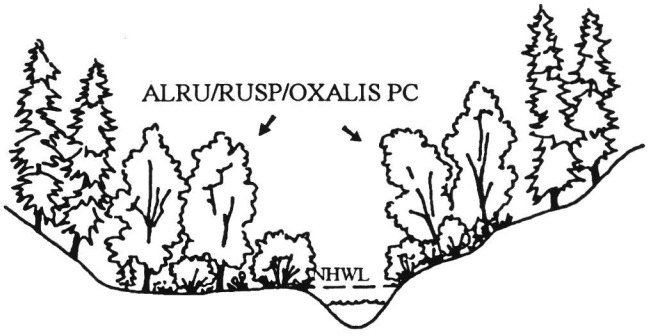
- ALRU/STCO4 PC - lacks thimbleberry
- ALRU/TOME-MOSI PC - may have thimbleberry, but it is not abundant
- ACCI PC - vinemaple is dominant; lacks moist-site forbs and red alder
- COST PA - red-osier dogwood is dominant; lacks red alder
- STCO4-ATFI PA - lacks thimbleberry and red alder as dominants

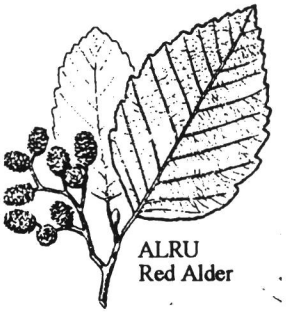
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/RUPA PC has not been described elsewhere in the Pacific Northwest.

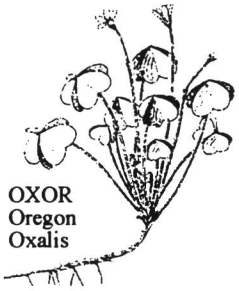
ALRU/RUSP/OXALIS PLANT COMMUNITY **HAS112**

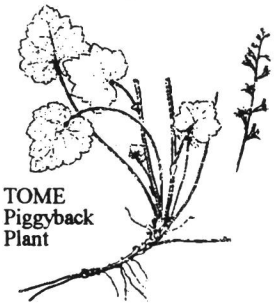
Alnus rubra/Rubus spectabilis/Oxalis spp.
Red Alder/Salmonberry/Oxalis

No. Plots = 32









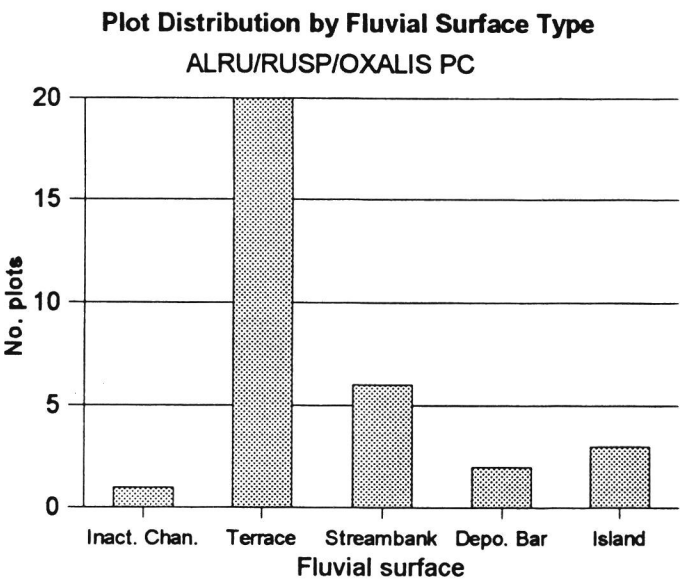
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/RUSP/OXALIS plant community (PC) is a deciduous hardwood forest type with well-developed shrub and herbaceous layers. Because this sample included stands of varying ages, the stand structures characterized were very diverse. The canopy of the youngest stands consisted of a dense tall shrub-hardwood regeneration layer, while older stands had both open and closed canopies of varying heights. Canopy heights in the oldest stands ranged from 100 to 150 feet. Moss cover in this type is variable. The tree layer is dominated by red alder (ALRU), sometimes along with bigleaf maple (ACMA). Traces of conifer regeneration - primarily western redcedar (THPL) and western hemlock (TSHE) - are not uncommon. The shrub layer consists of salmonberry (RUSP), frequently in association with stinkcurrant (RIBR). The forb layer is dominated by oxalis (OXOR, OXTR), often with smaller amounts of swordfern (POMU), piggyback plant (TOME), Cooley's hedgenettle (STCO4), and other moist-site species. In this sample of the ALRU/RUSP/OXALIS PC, there was an average of 19.5 vascular plant species per plot, with an average

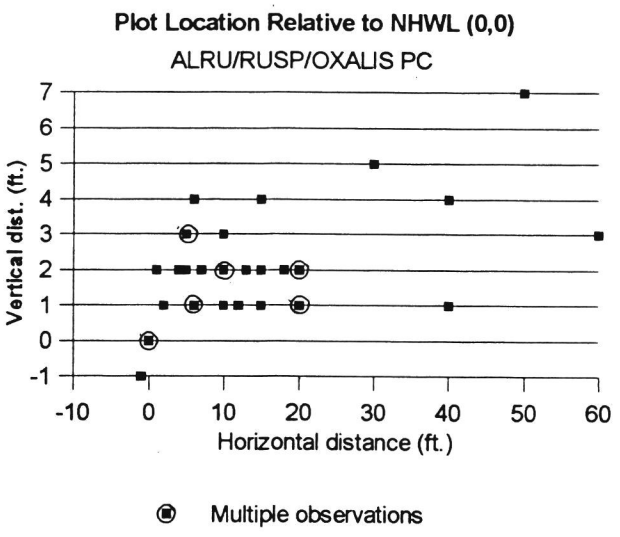
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	88	52
Trees (regen.)			
Acer macrophyllum	ACMA	44	6
Alnus rubra	ALRU	47	15
Shrubs			
Ribes bracteosum	RIBR	63	19
Rubus spectabilis	RUSP	100	24
Forbs			
Athyrium filix-femina	ATFI	63	7
Circaea alpina	CIAL	56	4
Galium triflorum	GATR	66	2
Montia sibirica	MOSI	53	4
Oxalis oregana	OXOR	88	20
Oxalis trilliifolia	OXTR	13	30
Polystichum munitum	POMU	75	5
Stachys cooleyae	STCO4	69	4
Tolmiea menziesii	TOME	72	13
Moss		64	25
Bare sand/soil		59	12
Gravel		22	8
Cobbles		31	10
Rock		44	14

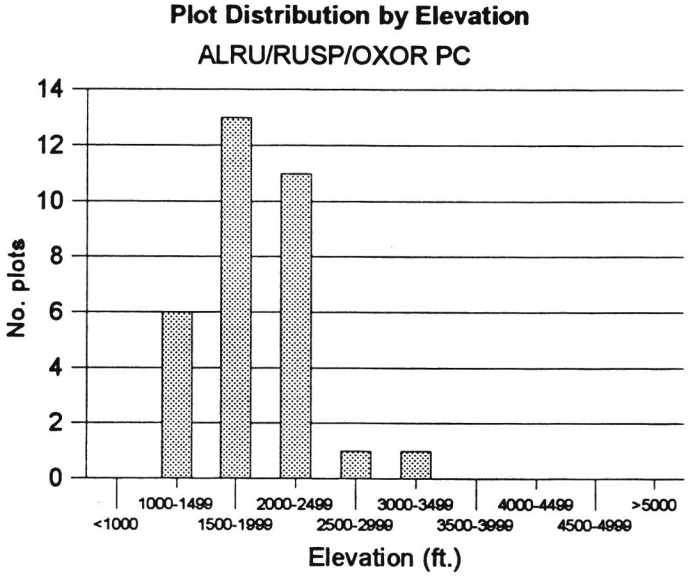
of 5.3 dominant species. This is high species diversity relative to riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/RUSP/OXALIS PC represents relatively warm, moist, productive sites with a fairly long growing season and deep, well-drained soils. It often occurs on fluvial surfaces that experienced high flows two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, the ALRU/RUSP/OXALIS PC occurred on mostly on gently sloping terraces, and occasionally on steeper streambanks. Plots were predominantly in the floodprone zone of alluviated







mountain valleys or incised moderate-gradient streams with some floodplain development (Rosgen B and C channel types), generally 1 to 4 feet above and within 50 feet lateral distance of the normal high-water line. The substrates sampled were primarily deep alluvial deposits of sand and silt, sometimes with the addition of gravel, but could also be a mixture of cobbles and gravel, or a layer (10-30 cm.) of sand/silt over cobbles. Organic matter was relatively abundant in the soil profile. The species present indicate soils are moist throughout the growing season. The ALRU/RUSP/OXALIS PC was found mostly below 3000 feet in elevation throughout the portion of the study area west of the Cascade crest. A similar community has been observed farther south in the Cascades of Oregon on the Willamette National Forest, but environmental and successional parallels have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/RUSP/OXALIS PC may represent the potential vegetation in sites that experience high flows every few decades that preclude conifer establishment. In less-

frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it probably represents a successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) plant association such as the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) type, or the riparian Western Redcedar/Salmonberry/Oxalis (THPL/RUSP/OXOR) association. The plots in this sample show some evidence that such succession is occurring; almost half of the plots had conifer regeneration (usually in trace amounts). This community may also be successional to the Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) association. The successional status of the ALRU/RUSP/OXALIS community is somewhat unclear, and may vary from site to site.

The ALRU/RUSP/OXALIS PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/RUSP/OXALIS PC may also significantly reduce stream velocity during periods of flooding, causing both onsite aggradation of fluvial surfaces, and reducing downstream effects to landforms and vegetation.

When the canopy is opened up, a vigorous response by red alder, salmonberry and stinkcurrant is likely. The herb layer, if not overwhelmed by shrubs, may also increase - oxalis, swordfern and ladyfern (ATFI) are the most likely to respond. All these species are good candidates for site rehabilitation in this type. Ground disturbance carries a risk of sedimentation, especially in finer-textured soils on steeper slopes.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. In the oldest stands, snags may be available that are large enough for cavity nesters such as sapsuckers, woodpeckers, and chickadees.

Regenerating red alder and bigleaf maple, and salmonberry provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species, especially on earlier successional sites. Salmonberry, stinkcurrant, and regenerating bigleaf maple provide fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of salmonberry and red alder. Salmonberry flowers also provide nectar for hummingbirds.

Some of the sites were on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ALRU/RUSP/OXALIS PC is usually located in areas of gentle topography at lower elevations, providing good big game habitat. Regenerating red alder, salmonberry, oxalis, and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

Many of these sites contribute toward the capability of an area to support beaver, though the stream gradient in a few areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide additional food for beaver. A beaver colony could be supported in the area

only if the ALRU/RUSP/OXALIS PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/RUSP/OXALIS PC is commonly found adjacent to other riparian types that are similar in composition, for example, the Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI), Red Alder/Oxalis (ALRU/OXALIS) and Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI) types. It was also frequently encountered in conjunction with the Coltsfoot (PEFR2) community.

UPLAND -- By far the most common upland associate of the ALRU/RUSP/OXALIS PC is the Western Hemlock/Swordfern-Oxalis plant association. The ALRU/RUSP/OXALIS PC was also occasionally found adjacent to other moist, productive Western Hemlock associations, such as the Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR), Western Hemlock/Alaska Huckleberry/Oxalis (TSHE/VAAL/OXOR) and Western Hemlock/Skunkcabbage (TSHE/LYAM) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/RUSP/OXALIS PC may be cnfused with the following types, and can be distinguished from them as noted below:

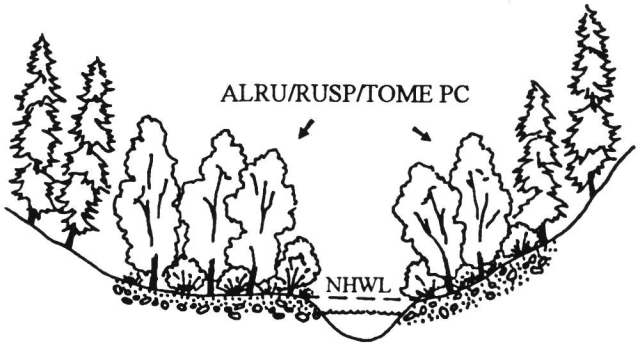
- □ THPL/RUSP/OXALIS PC - very similar, except conifers dominate tree layer
- □ ALRU/ACCI PC - lacks salmonberry and stinkcurrant; vinemaple is dominant
- □ ALRU/OPHO PC - devilsclub is dominant
- □ ALRU/OXALIS PC - lacks a well-developed shrub layer
- □ ALRU/PEFR2 PC - lacks a well-developed shrub layer; coltsfoot dominates the herb layer
- □ ALRU/RUSP/TOME PC - oxalis is not dominant; often on coarser substrates
- □ OPHO PA - devilsclub is dominant; lacks red alder
- □ RIBR-RUSP/ATFI PA - lacks red alder, otherwise can be very similar
- □ OXALIS PA - herb layer is similar; lacks dominance of red alder and shrubs

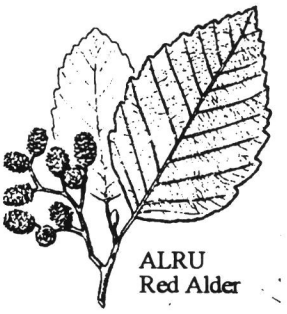
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/RUSP/OXALIS PC has not been described elsewhere in the Pacific Northwest.

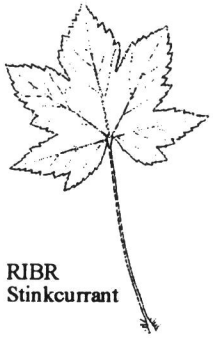
ALRU/RUSP/TOME PLANT COMMUNITY
Alnus rubra/Rubus spectabilis/Tolmiea menziesii
Red Alder/Salmonberry/Piggyback Plant

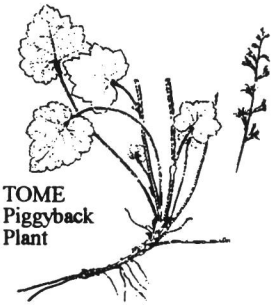
HAS113

No. Plots = 25









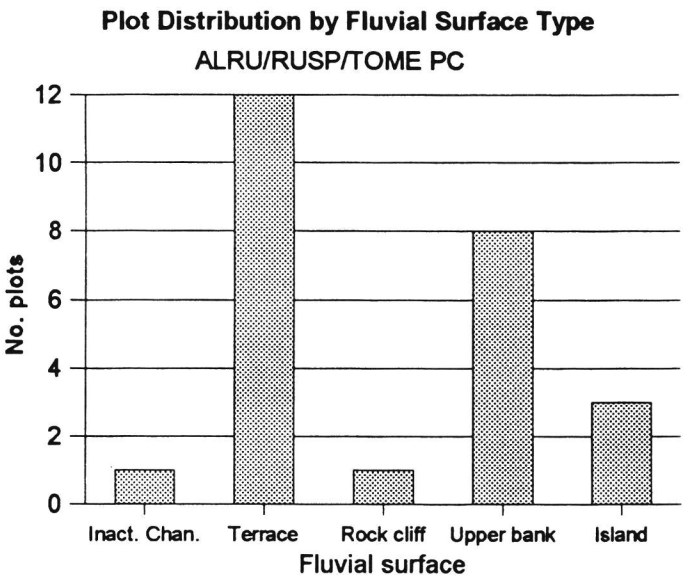
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/RUSP/TOME plant community (PC) is a deciduous hardwood forest type with well-developed tall shrub and herbaceous layers. This sample was drawn from stands with a variety of ages, and represented a diversity of stand structures. Earlier successional stages had a dense tall shrub-hardwood regeneration layer, while older stands had both open and closed canopies of varying heights. Canopy heights in the oldest stands ranged between about 75 and 100 feet. Moss cover in this type is usually low to moderate. The tree layer is dominated by red alder (ALRU) , sometimes along with bigleaf maple (ACMA). Regeneration is generally sparse and usually consists of red alder. The shrub layer has a dense cover of salmonberry (RUSP), usually in association with stinkcurrant (RIBR). The predominant forbs are piggyback plant (TOME) and ladyfern (ATFI), which are frequently associated with a variety of other moist-site species, such as Cooley's hedgenettle (STCO4), sweetscented bedstraw (GATR) Siberian miner's lettuce (MOSI) and swordfern (POMU). In this sample of the ALRU/RUSP/TOME PC, there was an average of

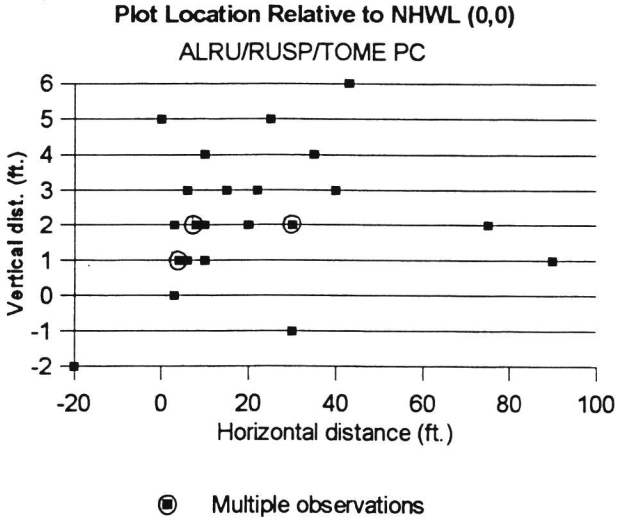
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	96	46
Trees (regen.)			
Alnus rubra	ALRU	28	12
Shrubs			
Ribes bracteosum	RIBR	76	20
Rubus spectabilis	RUSP	100	35
Forbs			
Athyrium filix-femina	ATFI	76	10
Circaea alpina	CIAL	40	6
Galium triflorum	GATR	56	2
Montia sibirica	MOSI	48	5
Oxalis oregana	OXOR	44	2
Oxalis trilliifolia	OXTR	8	3
Polystichum munitum	POMU	48	4
Stachys cooleyae	STCO4	60	3
Tolmiea menziesii	TOME	84	14
Moss		64	25
Bare sand/soil		60	9
Gravel		14	16
Cobbles		36	14
Rock		40	15

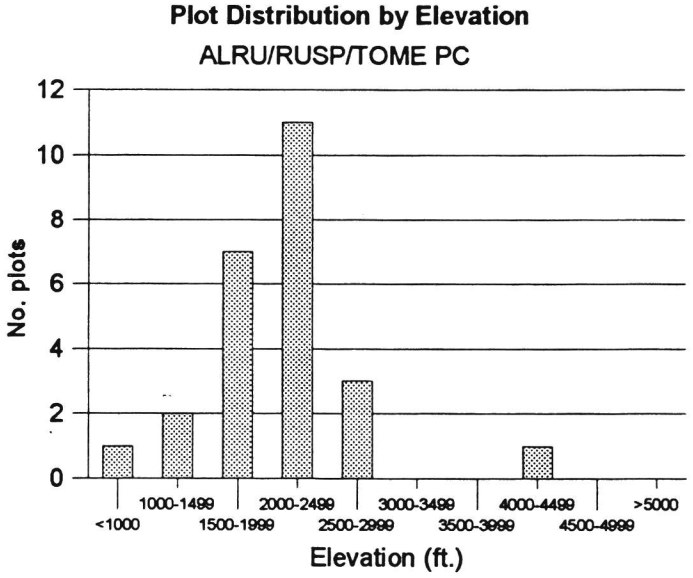
17.0 vascular plant species per plot, with an average of 5.4 dominant species. These are average values for riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/RUSP/TOME PC represents moist, productive riparian sites with a relatively long growing season. It often occurs on fluvial surfaces that experienced high flows two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, the ALRU/RUSP/TOME PC usually occurred on gently sloping (occasionally steep) terraces and streambanks in the floodprone zone of alluviated mountain valleys or incised







moderate-gradient streams with some degree of floodplain development (Rosgen B and C channel types), 1 to 6 feet above and within 40 lateral feet of the normal high-water line. The substrates were extremely variable, ranging from deep silt deposits with abundant organic matter to cobbles and rock. Many plots had significant (10-30%) cover of cobbles or rock at the surface. The species present suggest soils are very moist year-round. The ALRU/RUSP/TOME PC was found throughout the portion of the study area west of the Cascade crest, usually below 3000 feet in elevation. A similar community has been observed farther south in the Cascades of Oregon, on the Willamette National Forest, but environmental and successional parallels have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/RUSP/TOME PC may represent the potential vegetation in sites that experience high flows every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may

occur as a successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) plant association. The plots in this sample generally did not have conifer regeneration that would constitute evidence that such succession is occurring. The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/RUSP/TOME PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/RUSP/TOME PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of fluvial surfaces, and reducing dowmstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium, without significantly disrupting the plant community. When the canopy is opened up, a vigorous response by red alder, salmonberry and stinkcurrant is likely. The herbaceous layer, if not overwhelmed by the shrubs, will probably also increase, with ladyfern, piggyback plant and swordfern most likely to respond. All these species are good candidates for site rehabilitation in this type. Ground disturbance carries a risk of sedimentation, especially on sites with finer-textured substrates and steep slopes.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates that are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. In the oldest stands, snags may be available that are large enough for cavity nesters such as sapsuckers, woodpeckers, and chickadees.

Regenerating red alder and salmonberry provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species, especially on earlier successional sites. Salmonberry and stinkcurrant provide fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of salmonberry and red alder. Salmonberry flowers also provide nectar for hummingbirds.

Some of the sites were on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ALRU/RUSP/TOME PC is usually located in areas of flat to gentle topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, salmonberry, oxalis, and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

Many of these sites contribute toward the capability of an area to support beaver, though the stream gradient in some areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry provide additional food for beaver. A beaver colony could be supported in the area only if the ALRU/RUSP/TOME PC and adjacent red alder-dominated types are extensive enough

(approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/RUSP/TOME PC is commonly found adjacent to other riparian types that are similar in composition, for example, the Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI), Red Alder/Oxalis (ALRU/OXALIS) and Western Redcedar/Salmonberry/Oxalis (THPL/RUSP/OXOR) types. It was also frequently encountered in conjunction with the Coltsfoot (PEFR2) community.

UPLAND -- By far the most common upland associate of the ALRU/RUSP/TOME PC is the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) plant association. The ALRU/RUSP/TOME PC was also occasionally found adjacent to other moist, productive Western Hemlock associations, such as the Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR), Western Hemlock/Swordfern (TSHE/POMU) and Western Hemlock/Dwarf Oregongrape-Salal (TSHE/BENE-GASH) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/RUSP/TOME PC may be confused with the following types, and can be distinguished from them as noted below:

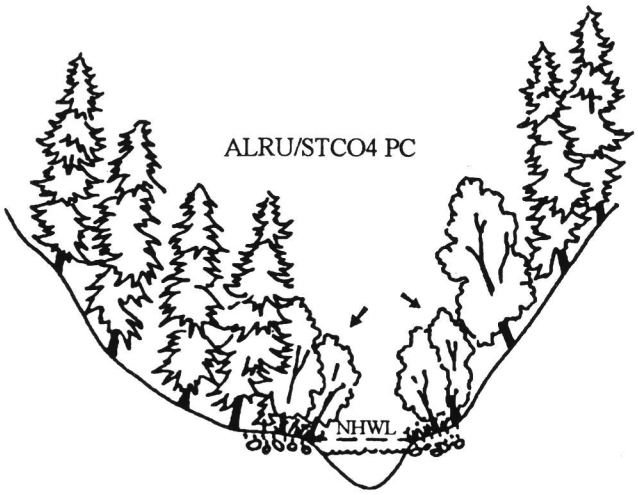
- THPL/RUSP/OXALIS PC - dominated by conifers; oxalis dominant in the herb layer
- ALRU/ACCI PC - vinemaple is a dominant; lacks salmonberry and stinkcurrant
- ALRU/OPHO PC - devilsclub is a dominant
- ALRU/RUSP/OXALIS PC - herb layer dominated by oxalis; often on finer substrates
- ALRU/TOME-MOSI PC - lacks a well-developed shrub layer
- ACCI/STCO4 PA - dominated by vinemaple; lacks salmonberry, stinkcurrant and red alder
- RIBR-RUSP/ATFI PA - lacks red alder; piggyback plant not as abundant; often more oxalis

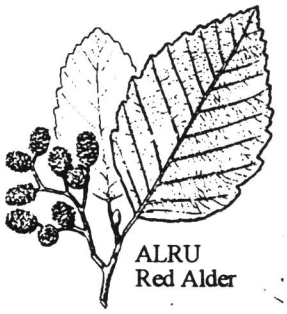
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/RUSP/TOME PC has not been described elsewhere in the Pacific Northwest.

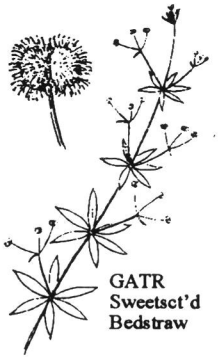
ALRU/STCO4 PLANT COMMUNITY
Alnus rubra/Stachys cooleyae
Red Alder/Cooley's Hedgenettle

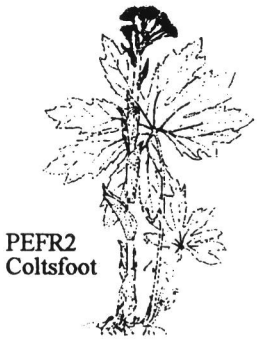
HAF224

No. Plots = 17









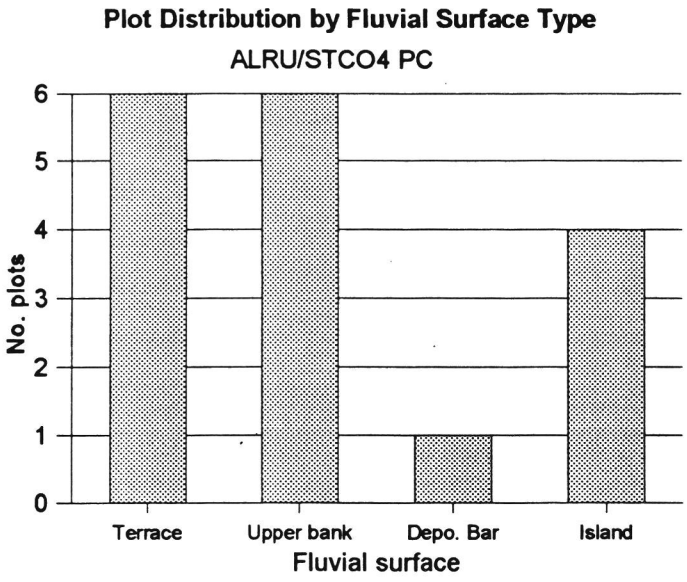
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/STCO4 plant community (PC) is a deciduous hardwood forest community with a well-developed herbaceous layer and scattered shrubs. This sample was drawn from stands with a variety of ages, and represented a diversity of stand structures. Earlier successional stages had a dense hardwood regeneration layer, while older stands had both open and closed canopies of varying heights. Canopy heights in the oldest stands ranged between about 35 and 45 feet. Moss cover in this type is variable. The tree layer consists of red alder (ALRU), in a variety of age classes. In addition, scattered seedlings of western hemlock (TSHE), Douglas-fir (PSME) and western redcedar (THPL) are not uncommon. Small amounts of salmonberry (RUSP) or thimbleberry (RUPA) may be present. In the herbaceous layer, a moderate to low cover of Cooley's hedgenettle (STCO4) is characteristic, and is frequently associated with small amounts of sweet-scented bedstraw (GATR), coltsfoot (PEFR2), ladyfern (ATFI) or Siberian miner's lettuce (MOSI). These was an average of 18.1 vascular plant species per plot in this sample of the ALRU/STCO4 PC, with an average of

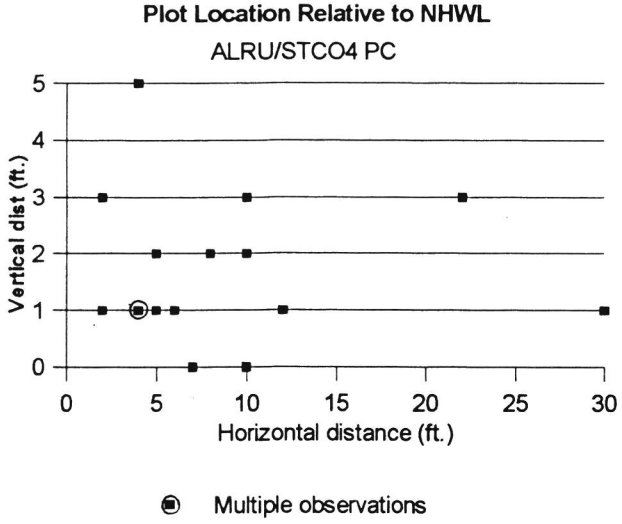
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	71	63
Trees (regen.)			
Alnus rubra	ALRU	76	18
Tsuga heterophylla	TSHE	29	1
Shrubs			
Rubus spectabilis	RUSP	47	3
Forbs			
Athyrium filix-femina	ATFI	47	6
Circaea alpina	CIAL	41	4
Galium triflorum	GATR	71	2
Lactuca muralis	LAMU	41	6
Montia sibirica	MOSI	47	2
Petasites frigidus	PEFR2	59	2
Stachys cooleyae	STCO4	82	15
Moss		59	26
Bare sand/soil		65	21
Gravel		47	12
Cobbles		53	14
Rock		47	24

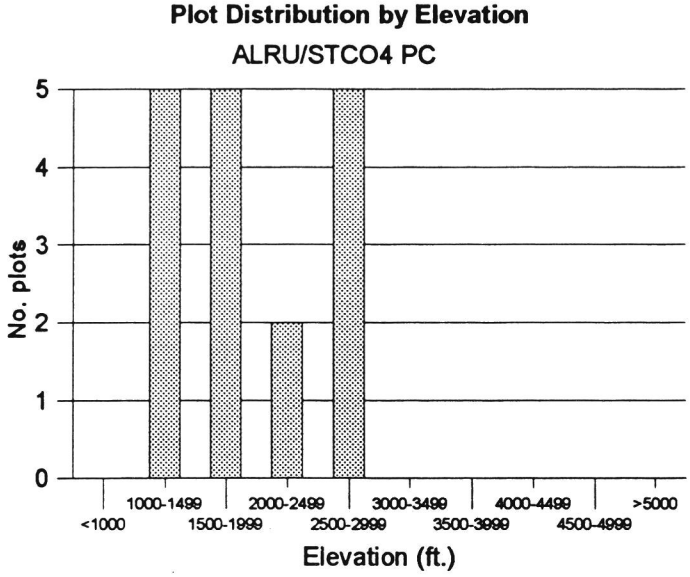
4.4 dominant species. These are average values for riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/STCO4 PC represents warm, moist environments with a relatively long growing season. It often occurs on fluvial surfaces that experienced high flows one to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, the ALRU/STCO4 PC generally occurred on gently sloping (rarely steep) terraces and streambanks in the floodprone zone of incised, moderate-gradient channels with some degree of floodplain development (Rosgen B and C channel







types), generally 1 to 3 feet above and within 15 feet lateral distance of the normal high-water line. Compared to other red alder types, landforms with the ALRU/STCO4 PC appear to experience high flows more often, and thus the vegetation is more likely to be found in an earlier successional stage with lower canopy heights. The substrates in this sample tended to consist of a layer of sand (5-15 cm. thick) over cobbles (suggesting one or more periods of low intensity flooding since the event that initiated vegetation succession), or a mixture of sand, gravel and cobbles (indicating a single flood event). Many plots had a significant amount of bare sand or rock (>10% cover). The plant species present indicate there is abundant moisture in the rooting zone throughout the growing season, although the surface may be dry. The ALRU/STCO4 PC occurred below 3000 feet in elevation, throughout the study area on both sides of the Cascade crest.

MANAGEMENT IMPLICATIONS --The ALRU/STCO4 PC may represent the potential vegetation in

sites that experience high intensity flooding every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) conifer plant association, or the riparian Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4) association. The plots in this sample show some evidence that such succession is occurring; almost than half of the plots had conifer regeneration (usually in trace amounts). However, it is not clear from the understory what the eventual "endpoint" plant association is likely to be. The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/STCO4 PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/STCO4 PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community. When the canopy is opened up, a vigorous response by red alder, salmonberry and ladyfern is likely. These species are also good candidates for site rehabilitation in this type. Where the surface soil layers are finer-textured (especially on steeper slopes), ground disturbance carries a risk of causing sedimentation of the adjacent stream.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. Red alder leaves support a high number of invertebrates which are consumed by many breeding birds. Small seed-eating birds and grouse consume red alder buds and catkins. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap.

Regenerating red alder and conifers, along with scattered shrubs, provide additional nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Rock provides cover for small mammals and amphibians. Scattered salmonberry and thimbleberry provide some fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder, salmonberry, and thimbleberry. Salmonberry flowers also provide nectar for hummingbirds.

Several of the sites were on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The ALRU/STCO4 PC is usually located in areas of gentle topography at low to moderate elevations, providing good big game habitat. Regenerating red alder, salmonberry and ladyfern provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Nitrogen fixation by alder may improve the quality of forage on these sites.

Many of these sites contribute toward the capability of an area to support beaver, though the stream gradient in a few areas may be too steep for beaver. Red alder provides food and building material for dams. Twigs

and bark of salmonberry and thimbleberry provide additional food for beaver. A beaver colony could be supported in the area only if the ALRU/STCO4 PC and adjacent red alder-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/STCO4 PC was typically found adjacent to riparian types characteristic of warm, moist environments. The most common were the Red Alder/Piggyback Plant/Siberian Miner's Lettuce (ALRU/TOME-MOSI), Maidenhair Fern (ADPE), Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4), Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) and Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) types.

UPLAND -- The ALRU/STCO4 PC was most commonly found within the Western Hemlock Zone adjacent to the Western Hemlock/Swordfern (TSHE/POMU) plant association or other moist-site associations, such as Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR) or Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU). It was also found in conjunction with a variety of types in the Pacific Silver Fir (Hemstrom and others, 1982; Brockway and others, 1983) and Grand Fir (Topik and others, 1988; Topik and others, 1989) Zones.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/STCO4 PC may be confused with the following types, and can be distinguished from them as noted below:

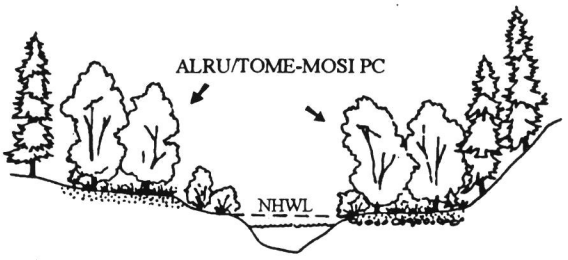
- □ THPL/ATFI-STCO4 PA - conifers are dominant; otherwise, herb layer very similar
- □ ALRU/ACCI PC - has a well-developed shrub layer dominated by vinemaple
- □ ALRU/OPHO PC - has a well-developed shrub layer dominated by devilsclub
- □ ALRU/OXALIS PC - herb layer dominated by oxalis; often on finer substrates
- □ ALRU/PEFR2 PC - herb layer dominated by coltsfoot
- □ ALRU/TOME-MOSI PC - piggyback plant and Siberian miner's lettuce are dominant
- □ ACCI/STCO4 PA - lacks red alder; shrub layer well-developed, dominated by vinemaple
- □ STCO4-ATFI - lacks tree layer dominated by red alder

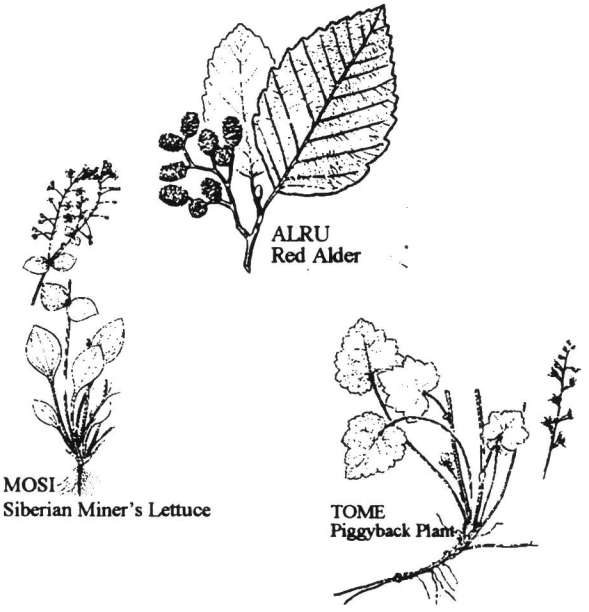
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/STCO4 PC has not been described elsewhere in the Pacific Northwest.

ALRU/TOME-MOSI PLANT COMMUNITY **HAF225**

Alnus rubra/Tolmeia menziesii-Montia sibirica
Red Alder/Piggyback Plant-Siberian Miner's Lettuce

No. Plots = 14





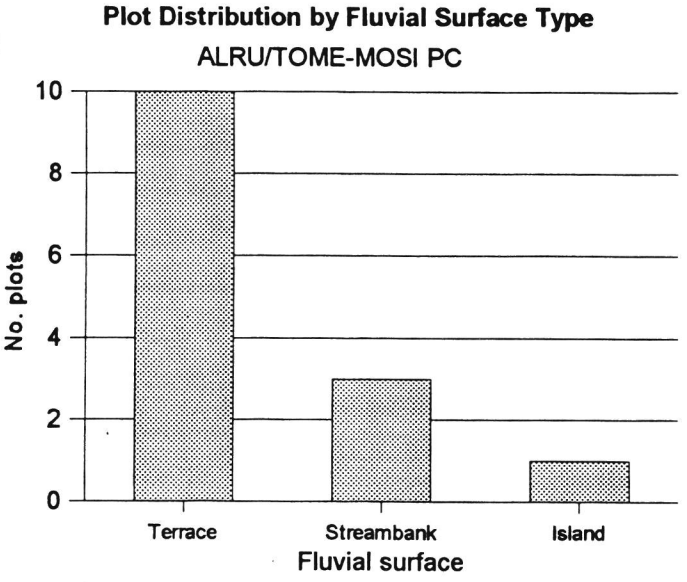
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU/TOME-MOSI plant community (PC) is a deciduous hardwood forest community with a sparse to moderate shrub layer and a diverse, well-developed herbaceous component. Virtually all the plots in this sample had a closed canopy that averaged between 30 and 60 feet in height. Moss cover in this type is variable. The tree layer is dominated by red alder (ALRU), both as mature trees and reproducing in the understory. Bigleaf maple (ACMA) and scattered western hemlock (TSHE) seedlings may be present. In the shrub layer, relatively low amounts of salmonberry (RUSP) are commonly present, sometimes along with thimbleberry (RUPA) or vinemaple (ACCI). The herbaceous layer is usually dominated by Siberian miner's lettuce (MOSI) and piggyback plant (TOME), often in association with a variety of moist-site forbs such as coltsfoot (PEFR2), wall-lettuce (LAMU), sweet-scented bedstraw (GATR), and Cooley's hedgenettle (STCO4). There was an average of 20.0 vascular plant species per plot in this sample of the ALRU/TOME-MOSI PC, with an average of 4.3 dominant species. This is very high

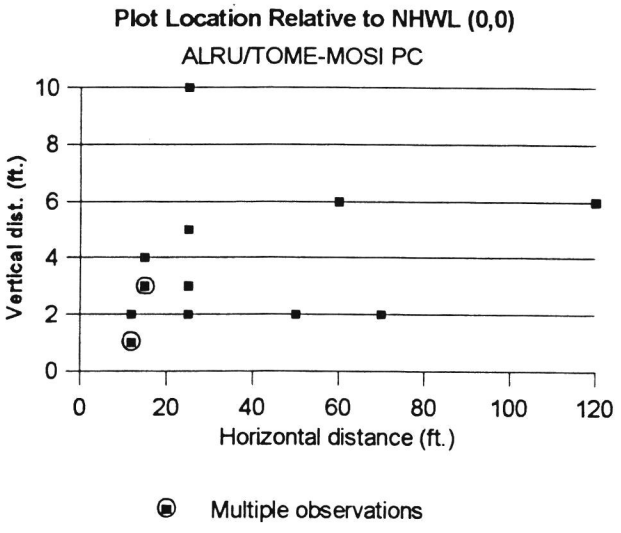
SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	100	68
Trees (regen.)			
Acer macrophyllum	ACMA	36	22
Tsuga heterophylla	TSHE	43	2
Shrubs			
Acer circinatum	ACCI	43	2
Rubus parviflorus	RUPA	43	4
Rubus spectabilis	RUSP	71	4
Forbs			
Athyrium filix-femina	ATFI	43	8
Circaea alpina	CIAL	43	6
Galium triflorum	GATR	79	2
Lactuca muralis	LAMU	64	8
Montia parvifolia	MOPA	43	9
Montia sibirica	MOSI	93	19
Petasites frigidus	PEFR2	71	2
Polystichum munitum	POMU	50	5
Stachys cooleyae	STCO4	64	3
Tolmiea menziesii	TOME	86	26
Moss		71	21
Bare sand/soil		64	12
Gravel		14	3
Cobbles		36	9
Rock		57	16

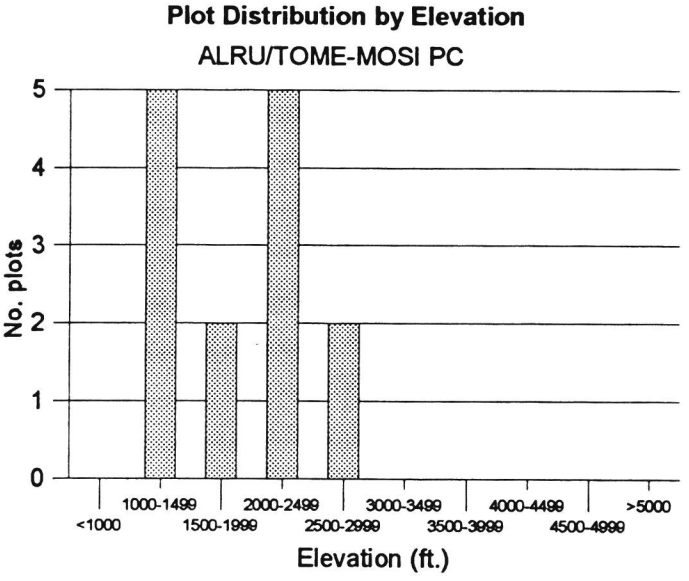
total species richness compared to riparian types overall, but only average dominance, reflecting the strong predominance of red alder, Siberian miner's lettuce and piggyback plant in this community.

ENVIRONMENT AND DISTRIBUTION -- The ALRU/TOME-MOSI PC reflects warm, moist, productive riparian environments with a relatively long growing season. It often occurs on fluvial surfaces that experienced high flows two to several decades ago (possibly during the storms of 1964 or the 1970s), and have since been in the process of recovery (with or without subsequent inundation).

In this sample, the ALRU/TOME-MOSI PC occurred primarily on flat to gently sloping terraces within the floodprone zone of alluviated mountain valleys







(Rosgen C channel type), or rarely, incised channels with some degree of floodplain development (Rosgen B channel type). Plots were often in wider valleys (100 to 600 feet floodplain width), and mostly occurred 1 to 6 feet above and within 25 feet lateral distance (although occasionally much farther) of the normal high-water line. The substrate normally consisted of 15 to 30 cm. of sand or sand/silt over cobbles, or sometimes a deep mixture of sand, silt and volcanic ash. The substrates often showed evidence of early soil development, with incorporation of organic matter into the upper layers. The species present indicate the rooting zone remains relatively moist throughout the growing season. The ALRU/TOME-MOSI PC was found at moderate to low elevations (below 3000 feet) in the portion of the study area west of the Cascade crest. A similar community has been observed farther south in the Cascades of Oregon, on the Willamette National Forest, but environmental and successional parallels to the ALRU/TOME-MOSI PC have not been established.

MANAGEMENT IMPLICATIONS -- The ALRU/TOME-MOSI PC may represent the potential vegetation in sites that experience high flows every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a successional stage of a Western Hemlock Zone (Topik and others, 1986; Halverson and others, 1986) conifer plant association. The plots in this sample show some evidence that such succession is occurring; almost half of the plots had conifer regeneration (usually in trace amounts). The successional status of this type is somewhat unclear, and may vary from site to site.

The ALRU/TOME-MOSI PC fulfills a number of important riparian functions. It provides significant shade and foliar input to the stream, slope stabilization, and enhancement of site productivity through nitrogen fixation by red alder. This community also constitutes a source of large wood, although red alder tends to be smaller and less long-lasting than conifer species. Floodplain communities like the ALRU/TOME-MOSI PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community. When the canopy is opened up, a vigorous response by red alder and possibly salmonberry, thimbleberry and vinemaple is likely. These species are also good candidates for site rehabilitation in this type.

WILDLIFE HABITAT RELATIONSHIPS -- Red alder trees provide quality nesting and foraging habitat for a number of canopy dwelling birds. The leaves support a high number of invertebrates which are consumed by many breeding birds. Sapsuckers and downy woodpeckers drill their sap wells in red alder trees, foraging on the sap and insects attracted to the sap. Small seed-eating birds and grouse consume red alder buds and catkins.

Red alder, bigleaf maple, and western hemlock seedlings along with scattered shrubs provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Scattered vinemaple, salmonberry, and thimbleberry provide some seeds and fruit for small birds, grouse, quail, band-tailed pigeon, small mammals, bears, fox and coyotes. Small mammals, rabbits, beaver, and porcupine eat the twigs, bark, and foliage of red alder, salmonberry, and thimbleberry. Salmonberry flowers also provide nectar for hummingbirds.

The ALRU/TOME-MOSI PC is usually located in areas of flat to gentle topography at low to moderate elevations, providing good big game habitat. Vinemaple, salmonberry and ferns provide year-round forage. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk as they migrate to and from higher elevation summer range. Additional moderate to high quality forage is available in the forb layer during spring and summer. Nitrogen fixation by alder may improve the quality of forage on these sites.

These sites contribute toward the capability of an area to support beaver. Red alder provides food and building material for dams. Twigs and bark of salmonberry and thimbleberry provide additional food for beaver. A beaver colony could be supported in the area only if the ALRU/TOME-MOSI PC and adjacent red alder and willow-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Alder resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU/TOME-MOSI PC was most commonly found in conjunction with the Sitka Willow/Coltsfoot (SASI2/PEFR2) and Sitka Willow (SASI2) types, as well as with other red alder types.

UPLAND -- Upland plant associations characteristic of warm, moist, productive environments were most frequently found near the ALRU/TOME-MOSI PC. The most common was the Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR) association, followed by the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR), Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) and Western Hemlock/Coolwort Foamflower (TSHE/TITR) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU/TOME-MOSI PC may be confused with the following types, and can be distinguished from them as noted below:

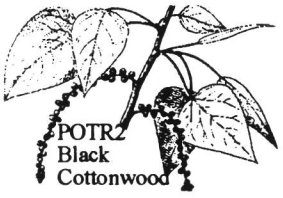
- ALRU/ACCI PC - has a well-developed shrub layer dominated by vinemaple
- ALRU/OPHO PC - has a well-developed shrub layer dominated by devilsclub
- ALRU/OXALIS PC - herb layer is dominated by oxalis
- ALRU/RUSP/TOME PC - has a well-developed shrub layer dominated by stinkcurrant and/or salmonberry
- ALRU/STCO4 PC - herb layer dominated by Cooley's hedgenettle
- ALRU/PEFR2 PC - herb layer dominated by coltsfoot
- ALRU/RUPA PC - has a well-developed shrub layer dominated by thimbleberry
- ACCI/STCO4 PA - lacks red alder; has a well-developed shrub layer dominated by vinemaple
- RIBR-RUSP/ATFI PA - lacks red alder, has a well-developed shrub layer dominated by salmonberry and stinkcurrant

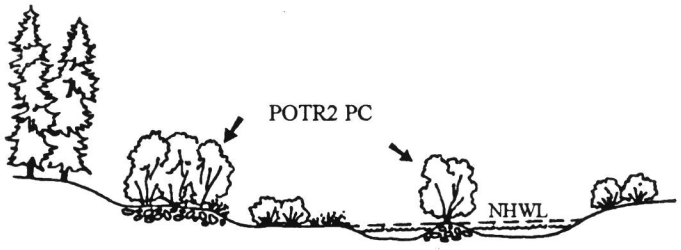
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU/TOME-MOSI PC has not been described elsewhere in the Pacific Northwest.

POTR2 PLANT COMMUNITY **HCS1**

Populus trichocarpa
Black Cottonwood

No. Plots = 3





ANMA
Pearly Everlasting

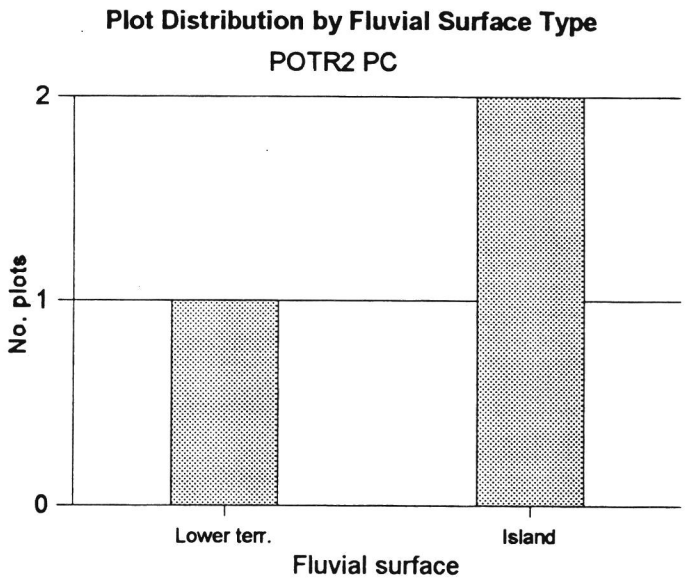
LOPU
Spanish Clover

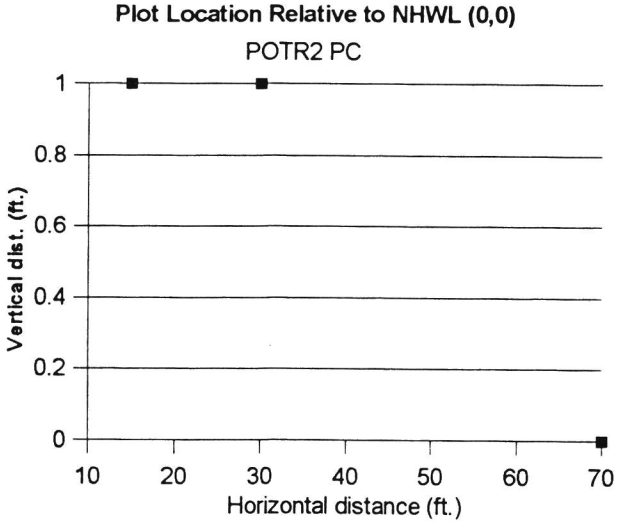
VEGETATION COMPOSITION AND STRUCTURE -- The POTR2 plant community (PC) consists of a relatively dense layer of black cottonwood (maximum canopy heights were 15-20 feet in this sample) with a very sparse layer of forbs and grasses. Moss cover in the POTR2 PC is usually low. The community is dominated by black cottonwood (POTR2), and often has scattered Douglas-fir (PSME) seedlings. Sitka willow (SASI2) may be present in significant amounts as well. In the forb layer, species characteristic of disturbed, dry substrates are commonly found in small amounts; pearly everlasting (ANMA), white hawkweed (HIAL), Spanish clover (LOPU), blue wildrye (ELGL) and common velvetgrass (HOLA) are nearly always present. In this sample of the POTR2 PC, an average of 14.3 vascular plant species per plot was found, with an average of 2.8 dominant species. This is among the least species-rich riparian plant communities found in this study, and reflects the fact that only a small number of plants are adapted to the harsh growing conditions.

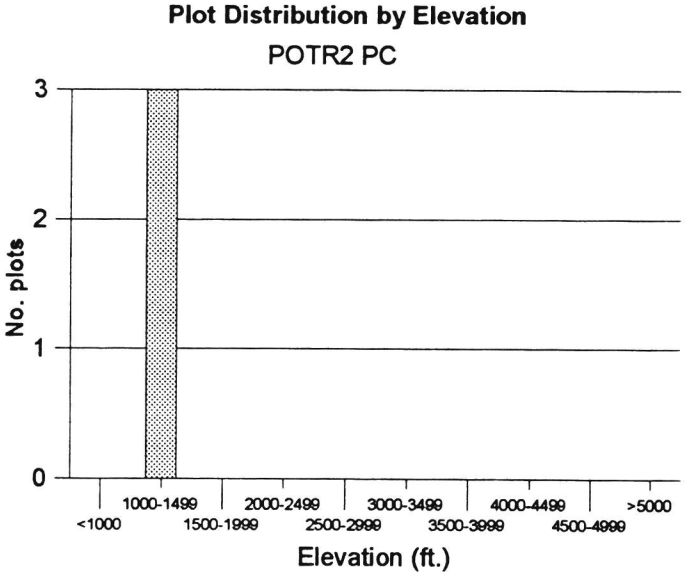
ENVIRONMENT AND DISTRIBUTION -- The

SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Populus trichocarpa	POTR2	67	23
Trees (regen.)			
Populus trichocarpa	POTR2	100	52
Pseudotsuga mertensiana	PSME	100	8
Shrubs			
Salix sitchensis	SASI2	67	13
Forbs			
Anaphalis margaritacea	ANMA	100	1
Hieracium albiflorum	HIAL	100	1
Lotus purshianus	LOPU	100	3
Grasses/grasslikes			
Elymus glaucus	ELGL	67	1
Holcus lanatus	HOLA	67	1
Moss		67	11
Bare sand/soil		67	55
Gravel		33	5
Cobbles		67	10
Rock		33	3

POTR2 PC represents warm riparian environments with very coarse substrates that have moisture deep in the rooting zone but are quite dry at the surface, have little organic matter accumulation. It occurs on landforms that experienced an intense flood and alluvial deposition event within the last few decades, very likely during the storms of 1964 or the 1970s, followed by a period of recovery. In this small sample, it occurred on deep alluvial deposits (mostly gravels and cobbles) on terraces or large islands within the floodprone zone of lower Yellowjacket Creek, a wide (600-700 ft. floodplain width) alluviated valley (Rosgen C channel type), very near its intersection with the Cispus River. In all cases, much of the plot surface was unvegetated. The plots in this sample occurred within 1 foot above the normal high-water line, and 15 to 70 feet away. All the plots were below 1500 feet in elevation. Although the







sample is small, this type was observed in similar environments throughout the portion of the study area west of the Cascade crest, and probably occurs east of the crest as well.

MANAGEMENT IMPLICATIONS -- The POTR2 PC may represent the potential vegetation in sites that experience high flows every few decades. In less-frequently flooded sites (for example, previously conifer-dominated sites that were disturbed by the floods of 1964 and the 1970s) it may occur as a relatively long-lived successional stage of a Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) conifer plant association. The plots in this sample show some evidence that such succession is occurring; virtually all had conifer regeneration, sometimes in significant amounts. However, the understory lacks clues as to what the eventual "endpoint" plant association is likely to be, and succession is likely to be very slow due to the droughtiness and high rock content of the substrate. The successional status of this type is somewhat unclear, and may vary from site to site.

The POTR2 PC has the potential to provide significant shade and foliar input to the stream if within sufficient proximity (in this sample, this was not the case), and stabilization of depositional surfaces. Given enough time, this community could also constitute a source of large wood, although black cottonwood tends to be smaller and less long-lasting than conifer species. Floodplain communities like the POTR2 PC may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

Black cottonwood, Sitka willow and possibly red alder (ALRU) are good candidates for site rehabilitation or enhancement in these harsh environments. Because the soils are extremely coarse and dry at the surface, inadequate moisture may initially inhibit plant establishment and growth, unless cuttings are placed deep enough to tap available moisture. Black cottonwood is frost tolerant, so is also a good candidate for site rehabilitation at higher elevations.

WILDLIFE HABITAT RELATIONSHIPS -- Black cottonwood and Sitka willow provide nest sites and nesting cover for birds and hiding cover for a variety of other wildlife species. Small birds, grouse, quail, and small mammals consume black cottonwood fruit. Many breeding birds consume invertebrates that live on and among the leaves of deciduous trees and shrubs.

POTR2 sites often occur on islands. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

The POTR2 PC is usually located in areas of flat topography at low elevations, providing good big game habitat. Cottonwood and willow provide year-round browse. However, hiding cover is limited during the winter when the deciduous shrubs and trees have lost their leaves. These sites are probably used during the summer by deer, and in the spring and fall by elk before they migrate to and from higher elevation summer range. Forage in the forb layer is sparse but high quality.

These sites contribute toward the capability of an area to support beaver. Cottonwood and willow provide food and building material for dams. A beaver colony could be supported in the area only if the POTR2 PC and adjacent willow-dominated types are extensive enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Willow resprouts after cutting by beaver and thus is resilient in areas used by beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In this sample, the POTR2 PC was most frequently found alongside the Sitka Willow (SASI2) and Sitka Willow/Coltsfoot (SASI2/PEFR2) types.

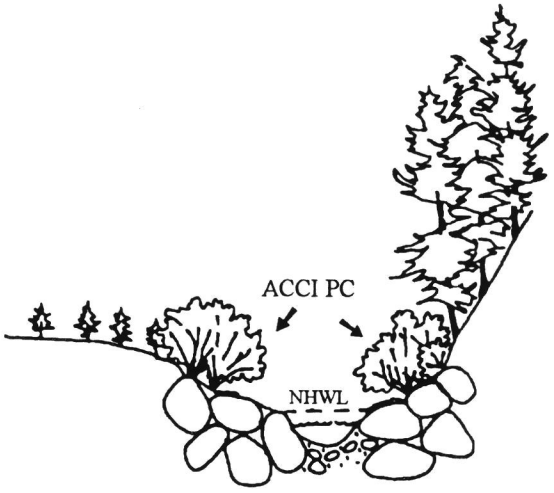
UPLAND -- The Western Hemlock/Dwarf Oregongrape (TSHE-BENE) plant association was the upland type most commonly found adjacent to the POTR2 PC in this study. Other warm/dry Western Hemlock Zone plant associations that might be expected to occur alongside the POTR2 PC are the Western Hemlock/Dwarf Oregongrape-Salal (TSHE/BENE-GASH) and the Western Hemlock-Salal (TSHE-GASH) types.

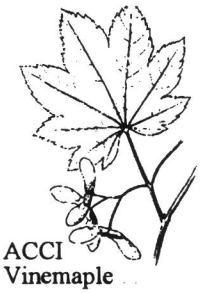
SIMILAR RIPARIAN TYPES IN THIS AREA -- The POTR2 PC is relatively unique, and is not likely to be confused with other riparian types described in this classification.

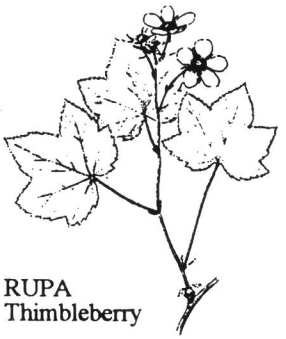
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The POTR2 PC has not been described elsewhere in the Pacific Northwest.

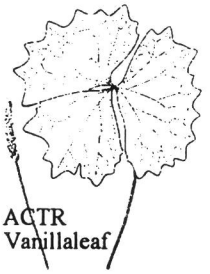
ACCI PLANT COMMUNITY
Acer circinatum
Vinemaple

No. Plots = 4







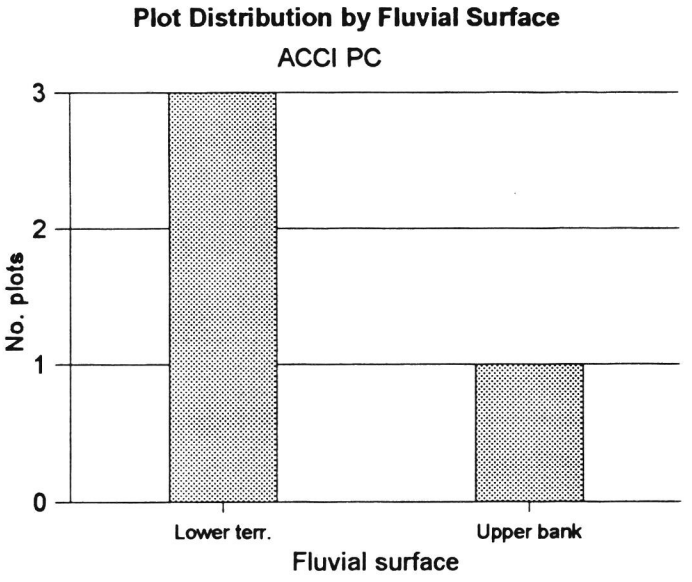


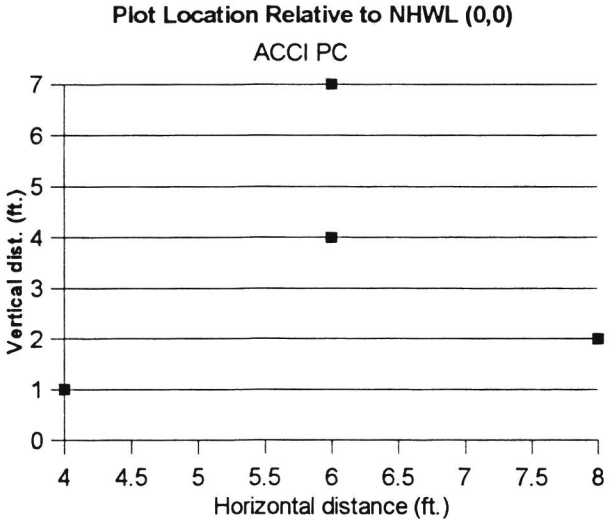
VEGETATION COMPOSITION AND STRUCTURE -- The ACCI plant community (PC) consists of a moderate to dense layer of tall shrubs with a sparse, depauperate herbaceous understory. Canopy height in this sample varied between 4 and 15 feet. Conifer seedlings are usually present in the ACCI PC. Moss cover is variable; this sample always had at least 10% cover of mosses. Vinemaple dominates the shrub layer, and is often associated with small amounts of thimbleberry (RUPA), wild rose (ROPI) or stinkcurrant (RIBR). Traces of vanillaleaf (ACTR), twinflower (LIBO2) and other upland species commonly occur in the herb layer. Seedlings of western hemlock (TSHE) or Pacific yew (TABR) are often present. There was an average of 9.8 vascular plant species per plot in this sample, with an average of 2.6 dominant species. This is the lowest species diversity found within the study area, and reflects the predominance in the vegetation community of a low number of species.

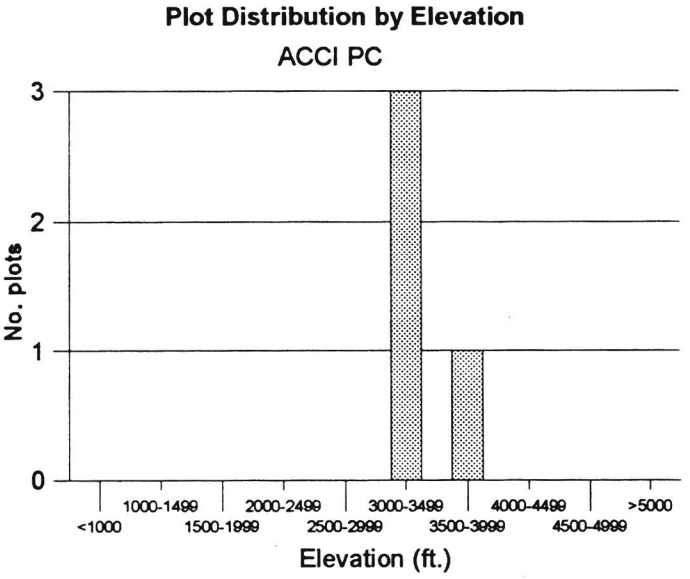
SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Tsuga heterophylla	TSHE	50	3
Shrubs			
Acer circinatum	ACCI	100	49
Berberis nervosa	BENE	50	3
Ribes bracteosum	RIBR	50	5
Rosa pisocarpa	ROPI	50	6
Rubus parviflorus	RUPA	50	8
Forbs			
Achlys triphylla	ACTR	75	1
Linnaea borealis	LIBO2	50	3
Moss		75	30
Bare soil/sand		50	10
Gravel		75	12
Cobbles		75	30
Rock		100	36

ENVIRONMENT AND DISTRIBUTION -- The ACCI PC is described on the basis of a very small sample from one stream (Fawn Cr. in the Clackamas River drainage), but has been observed elsewhere and is

likely to occur throughout the study area in relatively dry and warm sites. It was found between 3000 and 4000 feet in elevation, on flat to gently-sloping, dry, cobbly/rocky terraces and upper streambanks within the floodprone zone of an incised moderate-gradient stream (Rosgen channel type A), generally as a rather narrow fringe of vegetation. The substrates were variable mixes of sand, gravel and cobbles; the absence of moisture-loving plants suggests the surface layers are relatively dry during the growing season. At least 25% of the ground surface consisted of bare rock or cobbles (with a maximum value of 95%). All the plots in this sample were adjacent to clearcuts, and it is possible that the high shrub cover is related to the increase in light. These are sites that probably







experience high flows and deposition of coarse alluvium every several years to few decades, and that are well above the water's reach during periods of recovery.

MANAGEMENT IMPLICATIONS -- It is not clear whether the ACCI PC represents the vegetation potential on sites where it occurs. It is possible that it simply represents proliferation of vinemaple and other shrubs as a response to clearcutting adjacent to the stream, and that these sites would have been sparsely vegetated otherwise.

The ACCI PC does not contribute significantly to large wood in the stream, but is an important source of shade and foliar material, and contributes to stabilization of slopes. If vegetation is destroyed by ground disturbance in these sites, succession is likely to be slow due to soil droughtness and high rock content. Sitka willow (SASI2), red alder (ALRU), vinemaple (ACCI) and thimbleberry (RUPA) are likely to be the most successful species for site rehabilitation.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the ACCI-ALIN PC provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Small mammals eat vinemaple. The buds and catkins of mountain alder provide important winter food for siskins, chickadees, and grouse. Vinemaple and mountain alder provide moderate quality browse for deer and elk. Those sites at lower elevations may provide important winter forage.

Organic litter covering the ground provides good foraging substrate for insectivorous, ground-foraging wildlife. These species include sparrows, thrushes, towhees, shrews, amphibians and reptiles.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In sites where the ACCI PC was found, it was the only riparian vegetation type present.

UPLAND -- All of the plots in this sample of the ACCI PC were adjacent to clearcuts with the TSHE/RHMA-BENE (Western Hemlock/Rhododendron-Dwarf Oregongrape; Halverson and others, 1986) plant association. This sample is quite limited, and the ACCI PC probably occurs adjacent to a range of different plant associations within the Western Hemlock Zone and lower Pacific Silver Fir Zone.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ACCI PC may be confused with the following types, and can be distinguished from them as noted below:

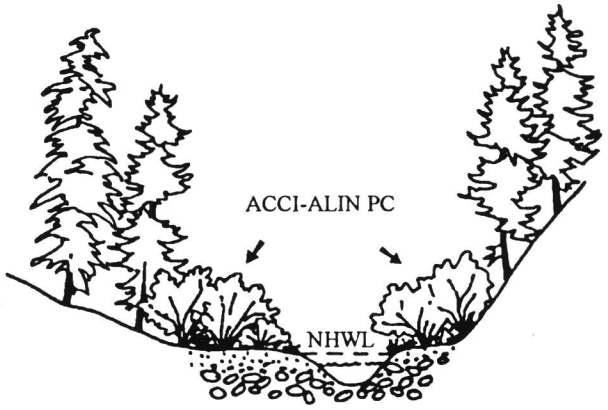
- ALRU/RUPA PC - dominated by red alder and thimbleberry; more moist-site herbs
- ACCI-ALIN PC - mountain alder is codominant with vinemaple; more moist-site herbs
- ACCI/STCO4 PA - understory dominated by moist-site herbs (e.g., Cooley's hedgenettle)

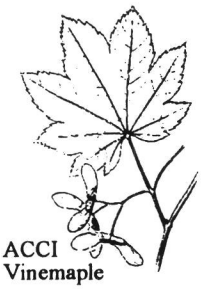
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ACCI PC has not been described elsewhere in the Pacific Northwest.

ACCI-ALIN PLANT COMMUNITY
Acer circinatum-Alnus incana
Vinemaple-Mountain Alder

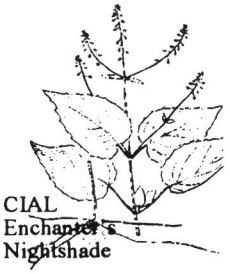
SW7111

No. Plots = 5




ACCI
Vinemaple

ALIN
Mtn.
Alder


CIAL
Enchanter's
Nightshade

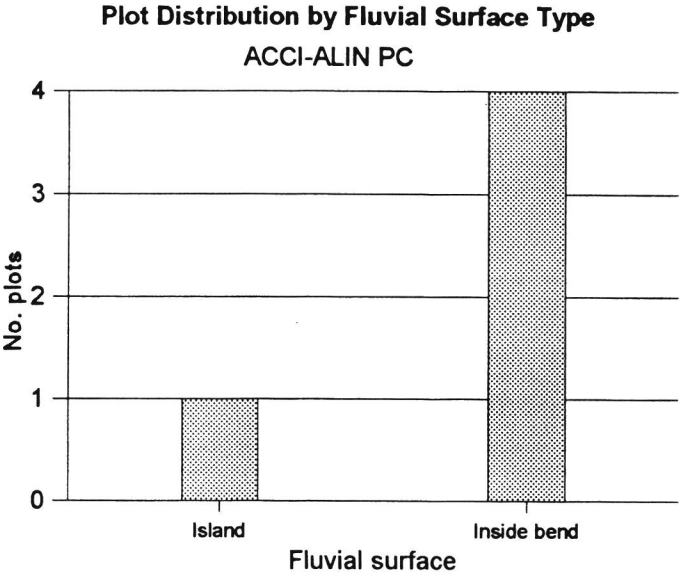
GATR
Sweetsct'd.
Bedstraw

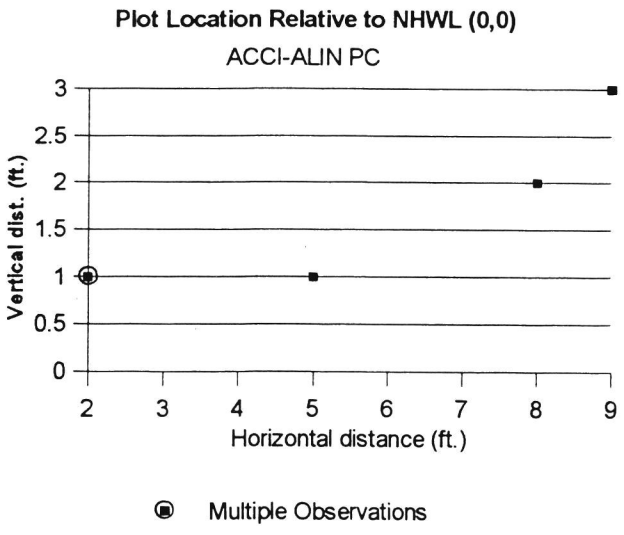
VEGETATION COMPOSITION AND STRUCTURE -- The ACCI-ALIN plant community (PC) consists of a dense layer of tall shrubs, with a sparse to moderate cover of forbs and sedges. Canopy height in this sample varied between 10 and 25 feet. A small number of conifer seedlings may be present. Moss cover is low. Vinemaple (ACCI) is the dominant shrub, and is associated with low to moderate amounts of mountain alder (ALIN). Ninebark (PHMA) is often present and sometimes very abundant. The forb layer has small amounts of enchanter's nightshade (CIAL) and sweetscented bedstraw (GATR), usually accompanied by woods strawberry (FRVE), starflower (TRLA2) and Dewey's sedge (CADE). Several other forb and graminoid species may occur, usually in small amounts. Traces of Douglas-fir (PSME) regeneration may be present. There was an average of 21 vascular plant species per plot in this sample of the ACCI-ALIN PC, with an average of 4.9 dominant species. This is very high overall species richness compared to riparian types overall, but only average dominance.

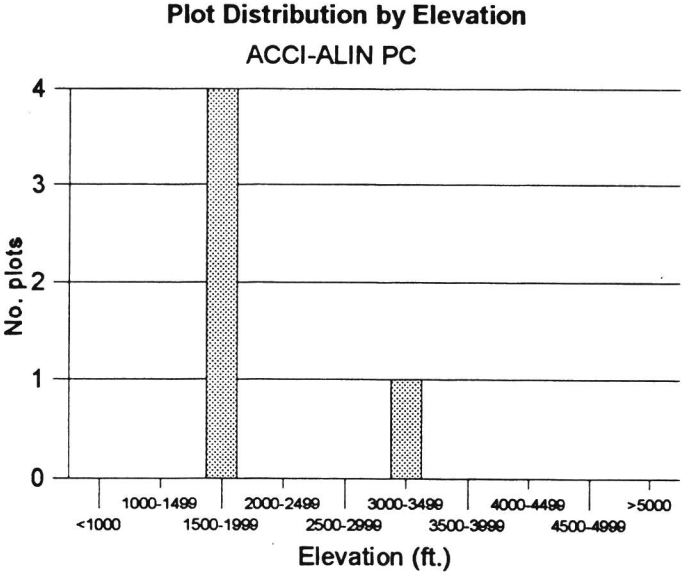
ENVIRONMENT AND DISTRIBUTION -- The

SPECIES	CODE	CONS.	%COV.
Shrubs			
Acer circinatum	ACCI	100	51
Alnus incana	ALIN	100	16
Physocarpus malvaceus	PHMA	60	39
Rubus ursinus	RUUR	80	6
Forbs			
Circaea alpina	CIAL	100	2
Fragaria vesca	FRVE	80	1
Galium triflorum	GATR	100	2
Osmorhiza chilensis	OSCH	60	2
Trientalis latifolia	TRLA2	80	4
Viola glabella	VIGL	60	1
Grasses/grasslikes			
Carex deweyana	CADE	80	1
Moss		60	3
Bare soil/sand		40	2
Gravel		20	7
Cobbles		80	5
Rock		80	3

ACCI-ALIN PC represents mesic sites within the floodprone zone at low to moderate elevations in streams east of the Cascades crest. This small sample is drawn from two streams on the Barlow Ranger District of the Mt. Hood National Forest - Little Badger Creek and the South Fork of Mill Creek - but is likely to be found in other eastside locations as well. It occurred on flat to gently-sloping streambanks in moderate-gradient, incised channels with some degree of floodplain development (Rosgen C channel type) , 1 to 3 feet above within 10 lateral feet of the normal high-water line, on alluvial deposits, usually a layer of sand over gravels or cobbles. There was little bare soil or rock, and the ground was usually covered by layer of organic litter. These are moist, productive, well-drained sites with a relatively long growing season, and a inundation interval of perhaps a few years to few decades. In some locations the ACCI-ALIN PC is a narrow streambank fringe type, in others it is more extensive floodplain type.







MANAGEMENT IMPLICATIONS -- From such a low number of plots, it was not possible to determine with certainty the successional status of the ACCI-ALIN PC. The relative sparseness of conifer seedlings suggests that the hydrologic regime is dynamic enough to prevent conifers from becoming established, in which case the ACCI-ALIN PC would represent the potential vegetation for the site.

Lacking a conifer component, the ACCI-ALIN PC is not a source of large wood for the stream. The dense shrub layer does provide significant shading for smaller streams during the summer, helps to stabilize the alluvial surfaces on which it is found, and creates substantial foliar input to the stream. Mountain alder, as a

nitrogen fixer, helps enhance productivity in these areas. Floodplain communities like the ACCI-ALIN PC may also significantly reduce stream velocity during floods, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium, without significantly disrupting the plant community. Sites with the ACCI-ALIN PC are productive but may be difficult to revegetate following ground disturbance. Revegetation is likely to be most challenging where the substrate has a high cobble content. Locally, lack of moisture may impede revegetation efforts. The best candidates for site restoration are likely to be vinemaple, mountain alder and ninebark. Wild strawberry (FRVE) may also be successfully used as a ground cover.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the ACCI-ALIN PC provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Small mammals eat vinemaple. The buds and catkins of mountain alder provide important winter food for siskins, chickadees, and grouse. Vinemaple and mountain alder provide moderate quality browse for deer and elk. Those sites at lower elevations may provide important winter forage.

Organic litter covering the ground provides good foraging substrate for insectivorous, ground-foraging wildlife. These species include sparrows, thrushes, towhees, shrews, amphibians and reptiles.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In this small sample, the ACCI-ALIN PC was usually the only riparian community found. In one site the Coltsfoot (PEFR2) and Common Horsetail (EQAR) associations also occurred.

UPLAND -- The ACCI-ALIN PC was primarily found adjacent to upland plant associations characteristic of dry, warm Douglas-fir and Grand Fir Zone sites (Topik and others, 1988). The most common was the Douglas-fir/Elk Sedge (PSME/CAGE) association, followed by the Grand Fir/Snowberry (ABGR/SYMPH) association. In addition, two moist floodplain associations were found adjacent to the ACCI-ALIN PC: Western Redcedar-Grand Fir/Vanillaleaf (THPL-ABGR/ACTR) and Western Hemlock-Grand Fir/Queencup Beadlily (TSHE-ABGR/CLUN).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ACCI-ALIN PC may be confused with the following types, and can be distinguished from them as noted below:

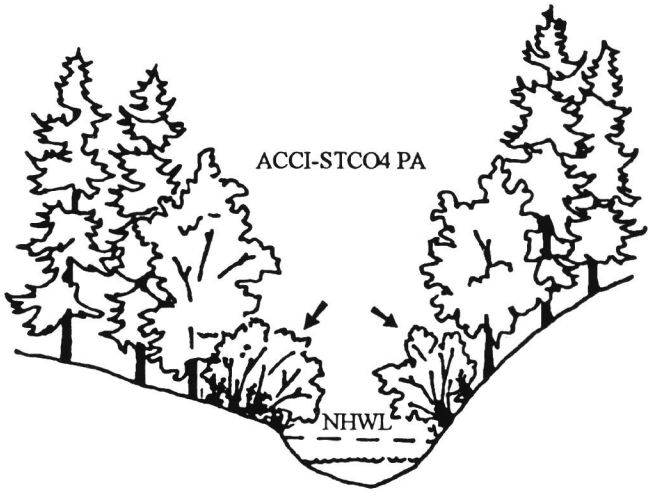
- □ ACCI PC - lacks mountain alder and moist-site herbs
- □ ACCI/STCO4 PA - lacks mountain alder; herb layer more well-developed, dominated by Cooley's hedgenettle
- □ ALIN-VAOV PA - lacks vinemaple; always has vanillaleaf; occurs at higher elevations

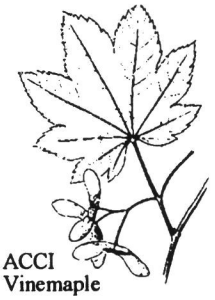
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ACCI-ALIN PC has not been described elsewhere in the Pacific Northwest.

ACCI/STCO4 PLANT ASSOCIATION **SW7112**

Acer circinatum/Stachys cooleyae
Vinemaple/Cooley's Hedgenettle

No. Plots = 11



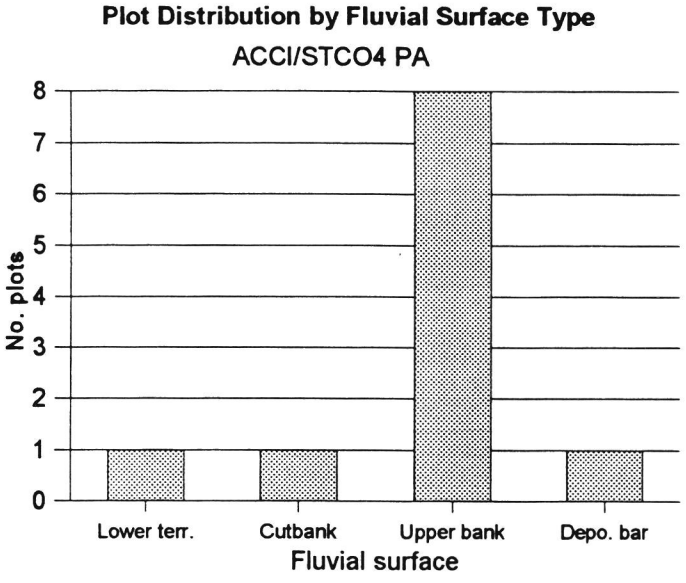


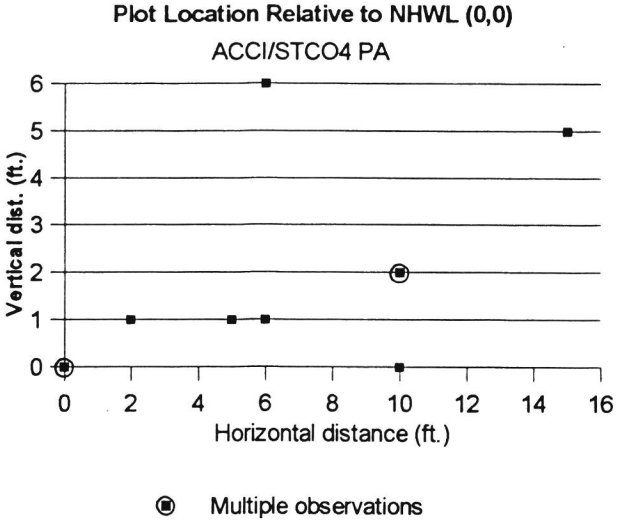
VEGETATION COMPOSITION AND STRUCTURE -- The ACCI/STCO4 plant association (PA) is a dense tall shrub community with a well-developed understory of forbs and grasses. Canopy heights in this sample averaged 10 to 20 feet. Small numbers of conifer seedlings may be present. Moss cover is variable. The plant community is dominated by vinemaple (ACCI), frequently with low to moderate amounts of devilsclub (OPHO) or salmonberry (RUSP). The herbaceous layer is a diverse mix of moist-site forbs and grasses. The most prominent are Cooley's hedgenettle (STCO4), piggyback plant (TOME), swordfern (POMU), ladyfern (ATFI) and maidenhair fern (ADPE). Small amounts of blue wildrye (ELGL) and other grasses are commonly present. Scattered conifer seedlings may be found - Douglas-fir (PSME), western hemlock (TSHE) and western redcedar (THPL) are most common. There was an average of 17.2 vascular plant species per plot in this sample, with an average of 4.2 dominant species. These are average values compared to riparian types overall.

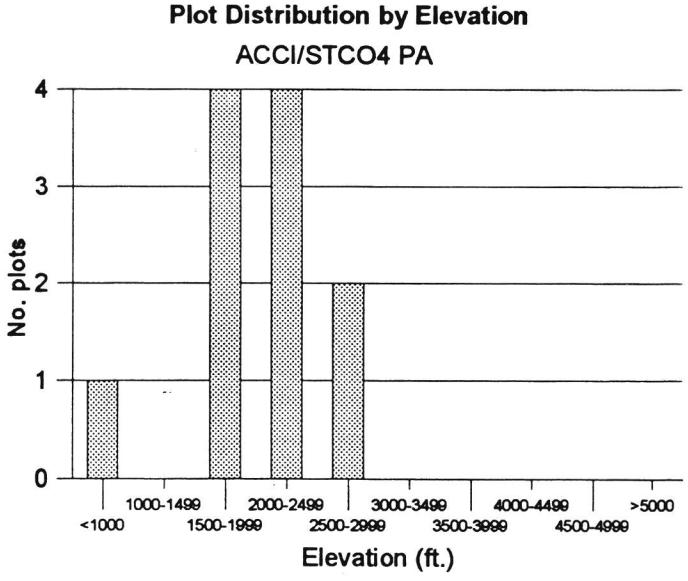
SPECIES	CODE	CONS.	%COV.
Shrubs			
Acer circinatum	ACCI	91	62
Oplopanax horridum	OPHO	45	5
Rubus spectabilis	RUSP	55	3
Forbs			
Adiantum pedatum	ADPE	45	3
Athyrium filix-femina	ATFI	52	5
Galium triflorum	GATR	64	1
Polystichum munitum	POMU	55	4
Stachys cooleyae	STCO4	82	5
Tolmiea menziesii	TOME	64	17
Moss		45	39
Bare soil/sand		73	9
Gravel		18	10
Cobbles		45	11
Rock		45	25

ENVIRONMENT AND DISTRIBUTION -- The ACCI/STCO4 PA represents moist, productive sites with

a relatively long growing season. One ecotype, the ACCI/STCO4 Streambank ET, is described for this association. It was found at low to moderate elevations on both sides of the Cascades crest, usually in the floodprone zone of smaller incised or somewhat alluviated stream drainages (Rosgen A and B channel types). In this sample, it mostly occurred on gently sloping to steep streambanks at or above the normal high-water line, within about 10 feet (lateral distance) of the bankfull zone. Substrates are varied, primarily deep deposits of silt and sand or several cm. of silt/sand over cobbles. Soil profiles frequently evidenced incorporation of organic matter. Most plots in this sample had a low to moderate amount of bare soil or rock. The key environmental features related to the ACCI/STCO4 Streambank ET are abundant moisture, adequate







drainage and an inundation interval that allows for shrub development but precludes establishment of conifers (probably every few years to few decades). Often this ecotype appears as a narrow streambank fringe between upland conifer forest and adjacent stream. Plant communities with similar species composition have been observed on the Mt. Baker/Snoqualmie National Forest, but with *Stachys mexicana* rather than *S. cooleyae*. A similar community has also been observed farther south in the Cascades of Oregon on the Willamette National Forest; environmental and successional parallels between these communities and our ACCI-STCO4 PC have not been determined.

MANAGEMENT IMPLICATIONS -- The ACCI/STCO4 PA probably represents the potential vegetation on sites where it occurs, given the hydrologic regime.

Lacking a mature conifer component, it does not contribute large wood to the stream, but does offer

significant shade, protection of the ground surface from erosion and input of foliar material.

These are sites that may, between high flow events, experience low intensity inundation every few years. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community. There is a risk of surface erosion as a result of ground disturbance on steeper slopes with finer-textured substrates. Increased light (for example, from opening the canopy of an adjacent conifer stand) is likely to result in greater shrub density and extent. These are productive, well-watered sites that generally have adequate drainage. The primary challenges to site restoration are likely to be localized rockiness or saturated soils (devilsclub and maidenhair fern are indicators of wet microsites in this type). Vinemaple, salmonberry, piggyback plant, blue wildrye and Cooley's hedgenettle are good candidates for revegetation of disturbed sites.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer of the ACCI/STCO4 PA provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Small mammals eat vinemaple seeds. Wildlife habitat diversity is higher in areas where salmonberry and devilsclub are present. Salmonberry and devilsclub produce berries for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine eat twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

Lower elevation sites with gentle slopes provide wintering areas for deer and elk. These areas also provide cool microsites for relief from summer heat. Vinemaple and salmonberry provide year-round browse. The grass/forb understory provides forage.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ACCI/STCO4 PA in this sample was most frequently associated with the Red Alder/Coltsfoot (ALRU/PEFR2), Maidenhair Fern (ADPE), Red Alder/Vinemaple (ALRU/ACCI) and Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4) types. Other riparian types indicative of moist conditions and a long growing season were also commonly found alongside the ACCI/STCO4 PA.

UPLAND -- Upland plant associations of productive, moist toe slope sites were most commonly associated with the ACCI/STCO4 PA. On the west side of the Cascade crest, the following Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) associations were most frequently encountered: Western Hemlock/Dwarf Oregongrape (TSHE/BENE/POMU) , Western Hemlock/Swordfern (TSHE/POMU), Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR), and Western Hemlock/Devilsclub/Swordfern (TSHE/OPHO/POMU). On the east side of the Cascades, moist Grand Fir Zone (Topik and others, 1988) types were predominant: Grand Fir/Vinemaple/Vanillaleaf (ABGR/ACCI/ACTR), Grand Fir/Vanillaleaf (ABGR/ACTR), Western Redcedar-Grand Fir/Vanillaleaf (THPL-ABGR/ACTR).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ACCI/STCO4 PA may be confused with the following types, and can be distinguished from them as noted below:

- □ THPL/ATFI-STCO4 PA - dominated by conifers; more often in broader floodplains
- □ ALRU/ACCI PC - red alder codominant with vinemaple
- □ ALRU/RUSP/TOME PC - red alder is dominant; lacks vinemaple; salmonberry and piggyback plant are dominant

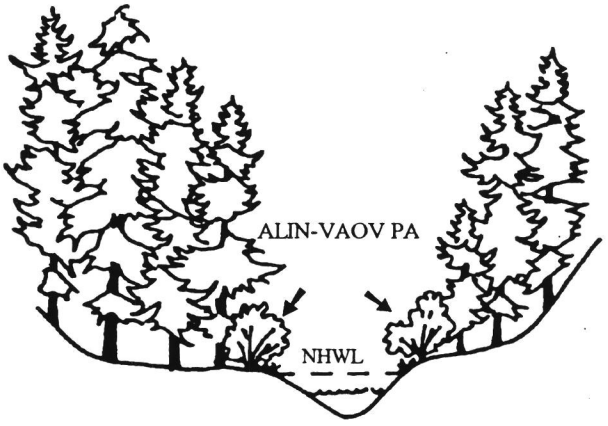
- □ ALRU/STCO4 PC - red alder is dominant; lacks vinemaple
- □ ALRU/TOME-MOSI PC - "
- □ ACCI-ALIN PC - mountain alder is codominant; has fewer moist-site herbs
- □ ACCI PC - few moist-site herbs; more often at higher elevations
- □ STCO4-ATFI PA - lacks vinemaple

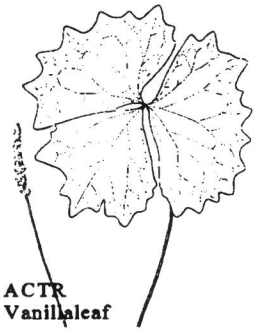
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ACCI/STCO4 PC has not been described elsewhere in the Pacific Northwest.

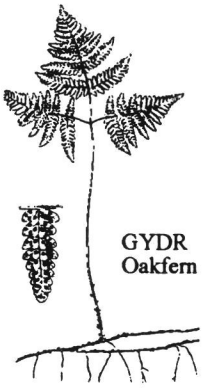
ALIN-VAOV PLANT ASSOCIATION
Alnus incana-Vaccinium ovalifolium
Mountain Alder-Ovalleaf Huckleberry

SW2131

No. Plots = 6





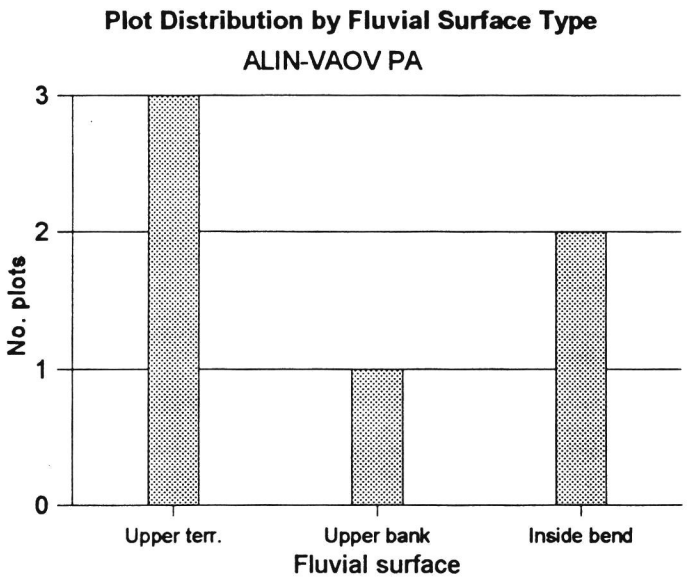


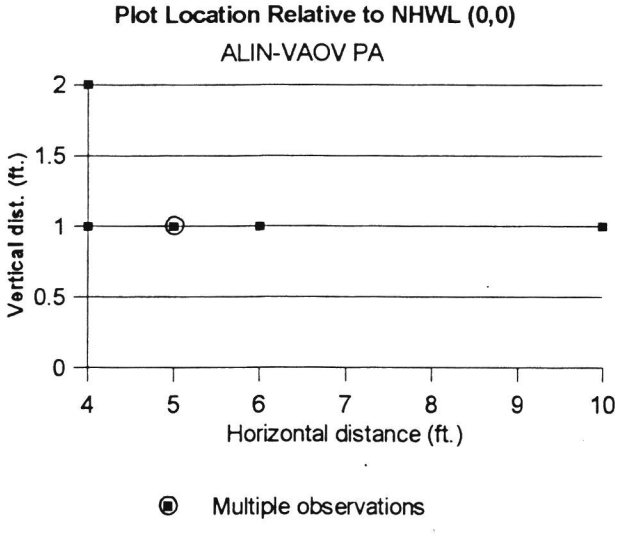
VEGETATION COMPOSITION AND STRUCTURE -- The ALIN-VAOV plant association (PA) is a moderately dense to dense community of tall and low shrubs, with a well-developed understory of forbs. Canopy height in this sample varied between 8 and 12 feet. Scattered conifer seedlings are sometimes present. Moss cover is low to moderate. Mountain alder (ALIN) and ovalleaf huckleberry (VAOV) co-dominate the shrub layer, often in association with prickly currant (RILA) and salmonberry (RUSP). The forb layer always has vanillaleaf (ACTR), along with a variety of moist-site species in varying amounts. The most abundant are oak-fern (GYDR), bunchberry dogwood (COCA), rosy twistedstalk (STRO), and coolwort foamflower (TITRU). On wetter sites, small amounts of skunkcabbage (LYAM) may occur. In this sample of the ALIN-VAOV PA, there was an average of 15.7 vascular plant species per plot, with an average of 8 dominant species. This is average species richness compared to riparian types overall, but much higher than average dominance.

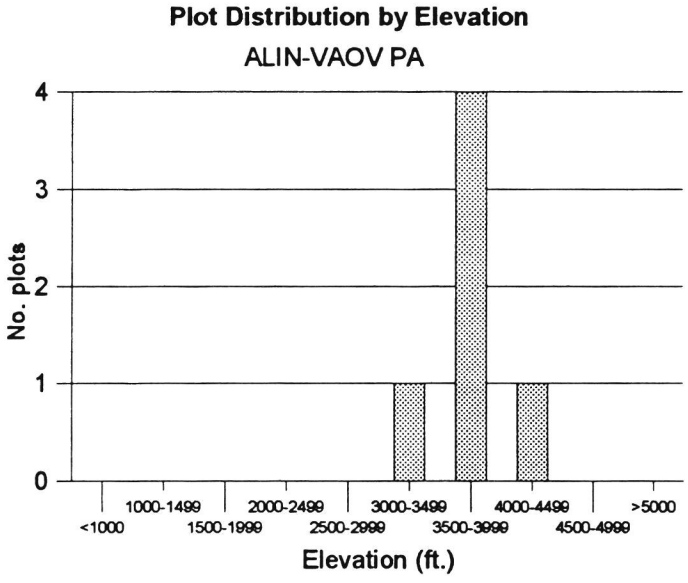
SPECIES	CODE	CONS.	%COV.
Shrubs			
Alnus incana	ALIN	100	36
Ribes lacustre	RILA	50	11
Rubus spectabilis	RUSP	67	8
Vaccinium ovalifolium	VAOV	100	15
Forbs			
Achlys triphylla	ACTR	100	5
Athyrium filix-femina	ATFI	50	2
Cornus canadensis	COCA	50	5
Gymnocarpium dryopteris	GYDR	83	5
Lysichitum americanum	LYAM	50	4
Streptopus amplexifolius	STAM	50	3
Streptopus roseus	STRO	50	5
Tiarella tri. var. unifol.	TITRU	50	4
Moss		83	25
Bare soil/sand		67	5

ENVIRONMENT AND DISTRIBUTION -- The ALIN-VAOV PA occupies streambank sites in cool, moist environments near the Cascade crest. Although this small sample was drawn from only three drainages

(Lowe, Stone and Threemile Creeks) on the Mt. Hood National Forest, it is likely to occur throughout the study area in equivalent sites. One ecotype, the ALIN-VAOV Streambank ET is described for this association. In this sample, it occured on flat to gently sloping streambanks and terraces at mid to upper elevations within a few feet (both vertically and horizontally) of the normal high-water line, most often as a rather narrow streambank fringe between the adjacent conifer forest and the stream, but sometimes more extensively. Substrates generally consisted of several cm. of silt or sand over cobbles or gravel, often with abundant organic material in the profile. There was little bare soil or rock. The plots in this sample were all from moderate-gradient, slope-bound valleys with some floodplain development







(Rosgen B and C channel types), but this ecotype probably occurs in other kinds of valleys as well. These are moist, generally well-drained, moderately productive sites that have a relatively short growing season, and are probably subject to infrequent low intensity floods that barely exceed the bankfull zone. A similar community has been observed farther south in the Cascades of Oregon, on the Willamette National Forest, but successional and environmental parallels with this type have not been established.

MANAGEMENT IMPLICATIONS -- The ALIN-VAOV PA probably represents the potential vegetation of the site, given the hydrologic regime. In some respects the plant community represents a mixing of understory forbs from the adjacent conifer stand with moisture-tolerant shrubs that proliferate in the streambank environment.

Lacking a mature conifer component of its own, the ALIN-VAOV PA does not contribute to down wood in

the stream, although the adjacent conifer stand probably does (if present). Shading of narrow streams and protection of finer-textured substrates from surface erosion are important functions of the vegetation in this ecotype. Foliar input to the stream is probably moderate, mostly from mountain alder. Mountain alder, a nitrogen fixer, enhances the productivity of soils in these sites.

Ground disturbance in these sites may lead to surface erosion and compaction. The presence of skunkcabbage indicates localized saturated soils and a high water table. For rehabilitation of disturbed sites, mountain alder and salmonberry are good species to consider. An increase in light (for example from openings created in the canopy of the adjacent conifer stand) is likely to result in greater shrub density and extent.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the ALIN-VAOV PA provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. The seeds, buds, and catkins of mountain alder provide important winter food for siskins, chickadees, and grouse. Salmonberry, huckleberry, prickly currant, and bunchberry dogwood provide berry crops for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, hares, and porcupine eat the twigs, bark, and leaves of mountain alder and salmonberry. Salmonberry also provides flower nectar for hummingbirds.

The flat topography and higher elevations associated with the ALIN-VAOV provide cool resting sites for deer and elk that provide relief from summer heat. Mountain alder, huckleberry, and salmonberry provide quality browse. Some forage is also available in the understory. Where these sites occur at higher elevations on the Gifford Pinchot National Forest prickly currant, salmonberry and huckleberry provide browse for mountain goats.

These sites contribute toward the capability of an area to support beaver. Mountain alder and red alder (from adjacent types) provide food and building material for dams. Salmonberry provides additional food. A beaver colony could be supported in the area only if the ALIN-VAOV PA and adjacent red alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALIN-VAOV PA is associated with other riparian types reflective of cool, moist conditions. In this sample, the most common was the Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV) association; others include the Red Alder/False Bugbane (ALRU/TRCA3), Brook Saxifrage-Arrowleaf Groundsel (SAAR4-SETR), Arrowleaf Groundsel-Few-Flowered Aster (SETR-ASMO) and Skunkcabbage (LYAM) types.

UPLAND -- A variety of cool/moist Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations occurred adjacent to the ALIN-VAOV PA in this sample. The most common were the Pacific Silver Fir/Fool's Huckleberry (ABAM/MEFE) and Pacific Silver Fir/Rhododendron-Alaska Huckleberry/Bunchberry Dogwood (ABAM/RHMA-VAAL/COCA) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALIN-VAOV PA may be confused with the following types, and can be distinguished from them as noted below:

□ ABGR-THPL/LYAM PA - has a well-developed tree layer; lacks dominance by ovalleaf

huckleberry; skunkcabbage is always dominant
□ ACCI-ALIN PC - has vinemaple as codominant with mountain alder; occurs at lower elevations; lacks vanillaleaf
□ ACCI/STCO4 PA - lacks mountain alder; has greater abundance of moist-site herbs
□ ALRU/TRCA3 PA - lacks mountain alder; red alder is dominant; herb layer is similar but has greater abundance of false bugbane
□ ALSI PA - Sitka alder is dominant; lacks mountain alder; herb layer is similar
□ VAAL-VAOV PA - lacks mountain alder; herb layer is similar

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALIN-VAOV PA has not been described elsewhere in the Pacific Northwest.

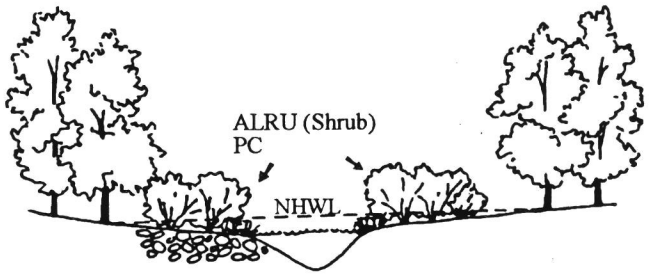
ALRU (SHRUB) PLANT COMMUNITY

SW2511

Alnus rubra
Red Alder (Shrub)

No. Plots = 9

ALRU
Red Alder



ELGL
Blue Wildrye

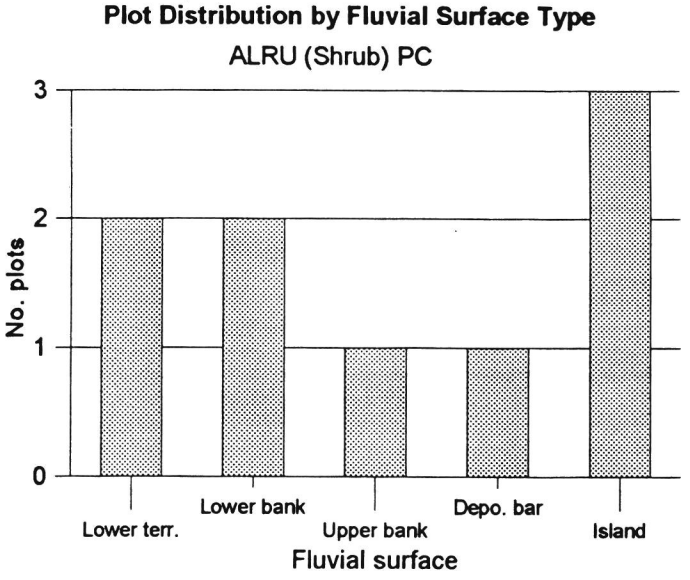
ANMA
Pearly
Everlasting

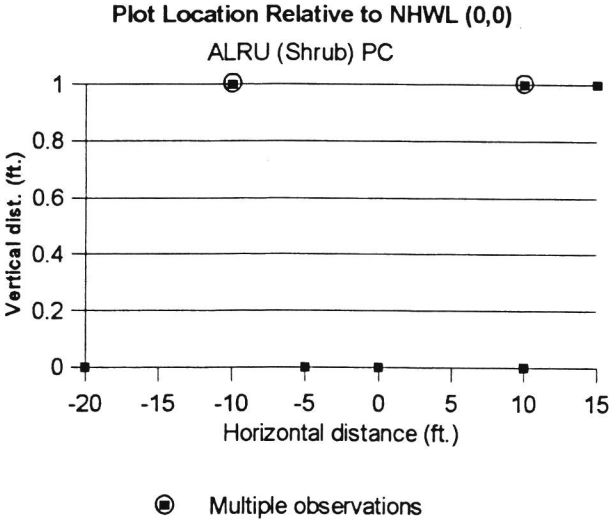
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU (Shrub) plant community (PC) consists of a moderate to dense cover of medium to tall shrubs, with a sparse understory of forbs and grasses. Canopy height in this sample varied between 4 and 15 feet. Scattered conifer seedlings may be present. Moss is absent or very low in abundance. Shrub-form red alder (ALRU) is the dominant plant species, and may be accompanied by small amounts of salmonberry (RUSP) or Sitka willow (SASI2). In the herbaceous layer, traces of blue wildrye (ELGL), pearly everlasting (ANMA), oxeye daisy (CHLE2), or white hawkweed (HIAL) may occur. There was an average of 13.8 vascular plant species per plot in this sample of the ALRU (Shrub) PC, with an average of 2.3 dominant species. These values are very low compared to riparian types overall, and reflect the strong dominance of this community by shrub-form red alder.

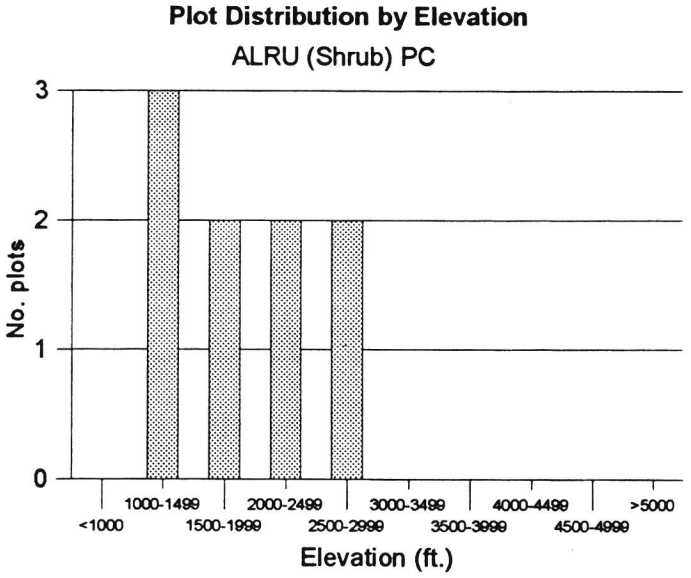
ENVIRONMENT AND DISTRIBUTION -- The ALRU (Shrub) PC represents open, warm, cobbly riparian sites of recent intense fluvial activity, with a relatively long growing season and high water table. In this sample, it occupied flat, bare cobble and gravel

SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Pseudotsuga menziesii	PSME	44	1
Shrubs			
Alnus rubra	ALRU	100	47
Rubus spectabilis	RUSP	44	1
Salix sitchensis	SASI2	44	5
Forbs			
Anaphalis margaritacea	ANMA	56	1
Chrysanth. leucanthemum	CHLE2	44	1
Hieracium albiflorum	HIAL	44	1
Stachys cooleyae	STCO4	44	1
Grasses/grasslikes			
Elymus glaucus	ELGL	56	2
Moss		33	3
Bare soil/sand		78	22
Gravel		89	22
Cobbles		89	26
Rock		11	1

deposits within the bankfull zone or <= 1 foot above the normal high-water line, on streambanks, terraces and islands in a variety of channel types, ranging roughly from 1200 to 2800 feet in elevation. It tended to be found in higher-order streams with relatively wide active channels, often in excess of 100 feet wide. These are sites that probably receive frequent (seasonal to every few years) inundation by high-velocity flows, preventing deposition of finer sediments and removing organic material from the surface. The frequency of flooding may prevent red alder from reaching tree stature. The substrates are very dry at the surface during the growing season, the water table is accessible to roots of red alder. In this sample, the ALRU (Shrub) PC was found in widely scattered locations on the Gifford Pinchot National







Forest west of the Cascade crest, but could occur throughout the study area at low to moderate elevations.

MANAGEMENT IMPLICATIONS -- The successional status of the ALRU (Shrub) PC is unclear. On one hand, if the fluvial surface becomes stabilized, it is possibly successional to a plant community dominated by mature red alder, such as the ALRU/ELGL (Red Alder/Blue Wildrye) association. On the other hand, it is very likely that these sites are inundated with sufficient frequency to prevent succession beyond the current young red alder community. Given the proximity of the plots in this sample to the bankfull zone, and the likely high seasonal fluctuation in flows on these higher-order channels, the latter seems to be the more probable alternative.

Lacking a mature conifer component, the ALRU (Shrub) PC does not contribute significantly to large woody

debris in the stream. It provides a limited amount of shade and substantial foliar material to the stream, as well as enhancement of site productivity through nitrogen fixation by red alder. During periods of more placid inundation, the shrubby vegetation may help increase deposition of organic debris and finer sediments, enhancing site productivity and making the substrate more hospitable to a wider range of species. The presence of red alder, a nitrogen fixer, also helps to significantly increase the nutrient component of the relatively sterile cobble substrates on which this community occurs.

Ground disturbance in sites with the ALRU (Shrub) PC is simply likely to cause temporary decrease in the cover of red alder, at worst; recovery is likely to occur over one or two seasons. If a greater shrub cover is desired, red alder and Sitka willow are the best candidates for site rehabilitation.

WILDLIFE HABITAT RELATIONSHIPS -- The shrub component of the ALRU (Shrub) PC provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

Small seed eating birds and grouse consume red alder buds and catkins. Diversity of wildlife habitat increases on those sites where salmonberry and Sitka willow are present. Salmonberry provides berries for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine eat the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds. Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians.

The wide channels, flat topography, and lower elevation sites associated with the ALRU (Shrub) PC provide wintering areas for deer and elk. These riparian areas also provide cool areas for relief from summer heat. Red alder, salmonberry and Sitka willow all provide year-round browse. The understory provides small amounts of forage.

These sites contribute toward the capability of an area to support beaver. Red alder and Sitka willow provide food and dam building materials for beaver. A beaver colony could be supported in the area only if the ALRU (Shrub) PC and adjacent red alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU (Shrub) PC in this sample occurred in combination with a wide range of riparian communities, most often the Red Alder/Thimbleberry (ALRU/RUPA), Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) and Coltsfoot (PEFR2) types.

UPLAND -- Moist, productive Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) and lower Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations were most frequently encountered adjacent to sites with the ALRU (Shrub) PC. The most common adjacent upland types were the Western Hemlock/Swordfern (TSHE/POMU) and Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU (Shrub) PC may be confused with the following types, and can be distinguished from them as noted below:

- ALRU/ELGL PC - much greater abundance of blue wildrye; rarely within bankfull zone

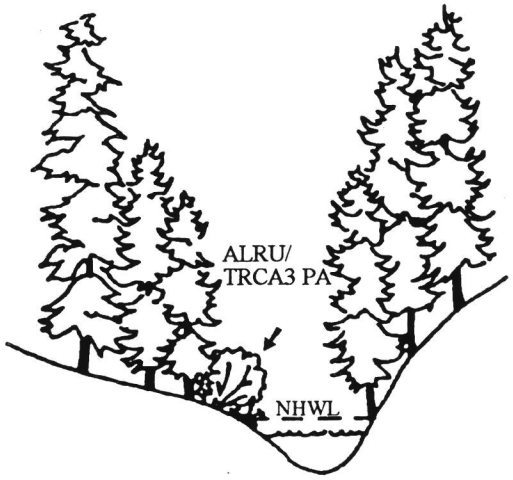
□ SASI2 PC - Sitka willow is dominant; occurs in very similar sites

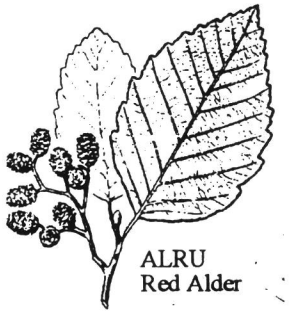
RELATIONSHIP TO OTHER CLASSIFICATIONS -- A Red Alder/Alluvial Bar community type was described by Crowe and Clausnitzer (1996) for eastern Oregon that is similar to our ALRU (Shrub) PC in substrate, fluvial landform and dominance of red alder. However, the eastern Oregon type has a more extensive herbaceous component, with species that are not found in this area. Crowe and Clausnitzer consider their Red Alder/Alluvial Bar type successional to associations with mature red alder.

ALRU (SHRUB)/TRCA3 PLANT ASSOCIATION **SW2512**

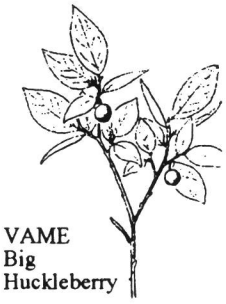
Alnus rubra/Trautvetteria caroliniensis
Red Alder (Shrub)/False Bugbane

No. Plots = 12




ALRU
Red Alder

VAOV
Ovalleaf
Huckle-
berry


VAME
Big
Huckleberry

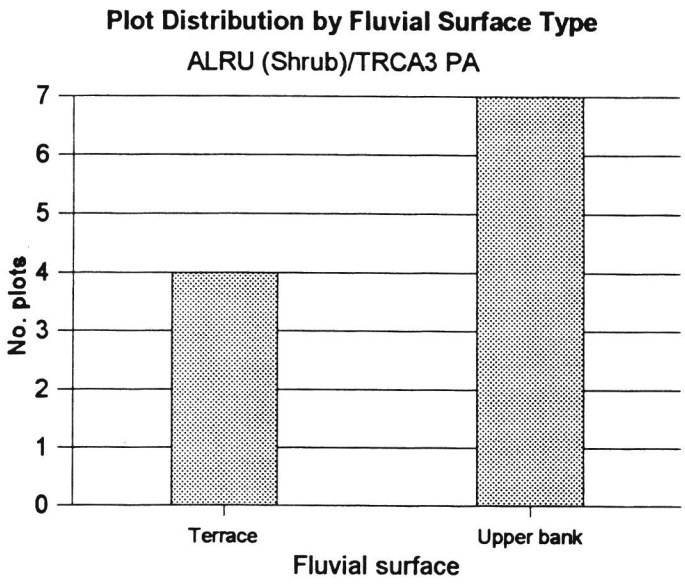
TRCA3
False Bugbane

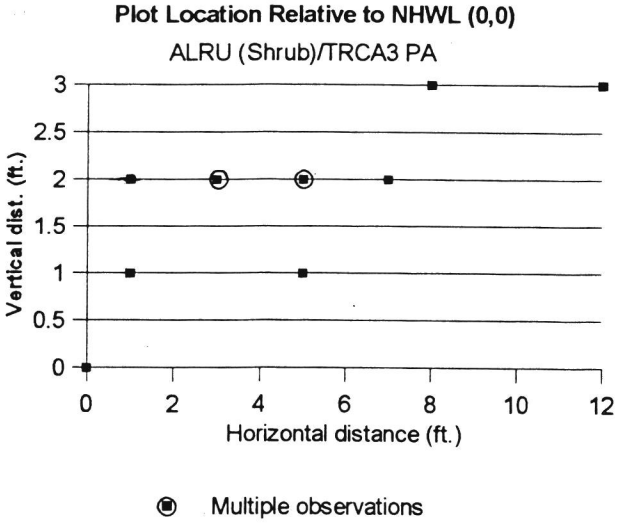
VEGETATION COMPOSITION AND STRUCTURE -- The ALRU (Shrub)/TRCA3 plant association (PA) consists of a dense layer of low to medium-tall shrubs, with a well-developed, diverse forb component. Canopy height in this sample varied between 5 and 12 feet. There are often a few scattered conifer seedlings present. Moss cover is variable. Shrub-form red alder (ALRU) is the dominant species, and is associated with either ovalleaf huckleberry (VAOV) or big huckleberry (VAME). Alaska huckleberry (VAAL) and salmonberry (RUSP) may also be present. In the herbaceous layer, the predominant species are generally false bugbane (TRCA3) and/or vanillaleaf (ACTR). These are accompanied by some combination of the following cool/moist-site species: Bunchberry dogwood (COCA), oak-fern (GYDR), twinflower (LIBO2), starry solomonseal (SMST) and claspleaf twistedstalk (STAM). Sitka valerian (VASI) is commonly present as well, and may be quite abundant. Seedlings of western hemlock (TSHE) or Pacific silver fir (ABAM) may be present, but in very limited numbers. There was an average of 16.4 vascular plant species per plot in this sample of the ALRU (Shrub)/TRCA3 PA, with an

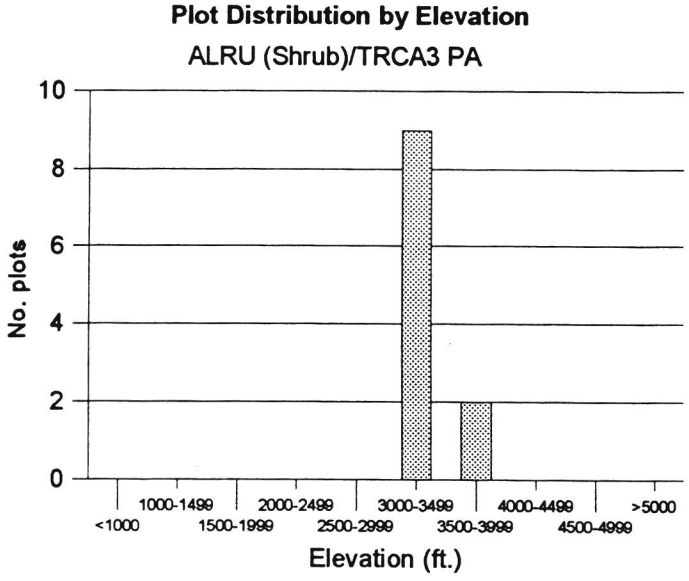
SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Tsuga heterophylla	TSHE	67	3
Shrubs			
Alnus rubra	ALRU	83	34
Rubus spectabilis	RUSP	33	19
Vaccinium alaskaense	VAAL	33	18
Vaccinium membran.	VAME	50	17
Vaccinium ovalifolium	VAOV	58	16
Viburnum edule	VIED	33	9
Forbs			
Achlys triphylla	ACTR	75	20
Cornus canadensis	COCA	75	8
Gymnocarpium dryopteris	GYDR	58	7
Linnaea borealis	LIBO2	42	15
Smilacina stellata	SMST	33	10
Streptopus amplexifolius	STAM	42	2
Trautvetteria carolinien.	TRCA3	83	20
Valeriana sitchensis	VASI	75	13
Moss		64	37
Bare soil/sand		82	15
Rock		9	30

average of 6.0 dominant species. This is average species richness compared to riparian types overall, but high dominance, reflecting the heterogeneous nature of this plant community.

ENVIRONMENT AND DISTRIBUTION -- The ALRU (Shrub)/TRCA3 PA represents cool, moist, relatively productive sites that are likely subject to infrequent low intensity floods that barely exceed the bankfull zone. In many cases it is expressed as a streambank fringe between a mature conifer stand and the stream, and could be interpreted as the proliferation of the forest understory in the canopy opening created by the stream, with the addition of a few light- and moisture-loving species (such as red alder and false bugbane). One ecotype, the ALRU (Shrub)/TRCA3 Streambank/Terrace ET, is described for this plant







association. In this sample, it occurred on flat (rarely steep) upper streambanks and alluvial terraces within the floodprone zone, mostly <= 2 feet above and within 10 feet lateral distance of the normal high-water line. It was found in moderate-gradient channels with some degree of floodplain development (Rosgen B and C channel types). It was most widespread in the Lost Cr. and Trout Lake Cr. drainages on the Gifford Pinchot National Forest, but was also found in the upper Clackamas River drainage on the Mt. Hood National Forest. It is likely to occur throughout the study area at mid to upper elevations, especially near the Cascades crest. The substrates in this ecotype are finer-textured alluvial deposits, generally a mixture of silt and sand several cm. thick (sometimes >1m.) over cobbles or gravel. There is generally a moderate amount of bare soil, but very little rock.

A puzzling feature of this ecotype is the presence of red alder in shrub form. Given the probability of long intervals between major fluvial disturbances and the abundance of moisture and light, a greater component of

mature red alder might be expected. What is keeping red alder from achieving tree stature in these sites? One explanation is growing season frost. At the elevations where this ecotype occurs, frost is a possibility in openings during the summer. Throughout the study area and across the range of riparian communities, red alder canopy height decreased dramatically above 3000 feet in elevation.

MANAGEMENT IMPLICATIONS -- Given the hydrologic regime, the ALRU (Shrub)/TRCA3 PA likely represents the potential vegetation on sites where it occurs.

Lacking a mature conifer component, this type does not contribute to the input of large wood to the stream, although the adjacent conifer stand likely does. It may contribute somewhat to stream shading on smaller streams, to foliar input, and to enhancement of site productivity through nitrogen fixation by red alder. It likely protects streambanks from surface erosion, but probably offers only limited bank stabilization, due to rather shallow roots. (One plot demonstrated this fact by falling as one large chunk into the stream while the data were being recorded. Fortunately, no lives were lost.)

Ground disturbance in this ecotype may result in soil erosion and compaction. Huckleberries (big, Alaska and ovalleaf) and red alder are good candidates for site restoration. For ground cover, bunchberry dogwood and twinflower are worth considering. Cool temperatures during the growing season may hamper revegetation efforts in frosty sites.

WILDLIFE HABITAT RELATIONSHIPS -- The shrub component of the ALRU (Shrub)/TRCA3 PA provides structure for nest sites for birds and hiding cover for a variety of wildlife species. Huckleberries, salmonberry, and bunchberry dogwood provide fruit for a wide variety of wildlife species including small birds, grouse, quail, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine eat the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

Areas with flat topography at higher elevations associated with the ALRU (Shrub)/TRCA3 PA provide cool sites for relief from summer heat for deer and elk. Red alder, huckleberry, salmonberry, bunchberry dogwood and Sitka valerian provide high quality summer forage for deer and elk. Huckleberry and salmonberry provide forage for mountain goats.

These sites contribute toward the capability of an area to support beaver. Red alder provides food and building material for dams. Salmonberry provides additional food for beaver. A beaver colony could be supported in the area only if the ALRU (Shrub)/TRCA3 PA and adjacent mountain alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALRU (Shrub)/TRCA3 PA occurred adjacent to riparian communities that reflect cool environments, for example the Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV) and Mountain Alder-Ovalleaf Huckleberry (ALIN-VAOV) types.

UPLAND -- Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations commonly associated with cool, moist, productive environments were frequently found adjacent to the ALRU (Shrub)/TRCA3 PA. Those encountered most often include the Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL), Pacific Silver Fir/Big Huckleberry/Queencup Beadlily (ABAM/VAME/CLUN) and Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALRU (Shrub)/TRCA3 PA may be confused with the following types, and can be distinguished from them as noted below:

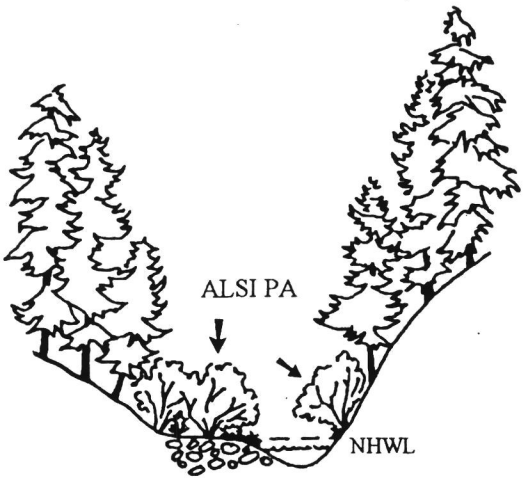
- ALRU/PEFR2 PC - occurs at lower elevations; coltsfoot can be mistaken for false bugbane
- ALIN-VAOV PA - dominated by mountain alder; lacks red alder and false bugbane; herb layer quite similar
- ALSI PA - dominated by Sitka alder; lacks red alder; herb layer similar but lacks false bugbane
- VAAL-VAOV PA - red alder not dominant; herb layer similar but lacks false bugbane

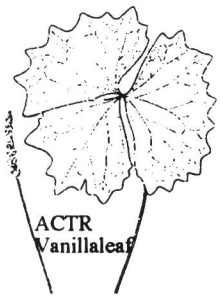
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The ALRU (Shrub)/TRCA3 PA has not been described elsewhere in the Pacific Northwest.

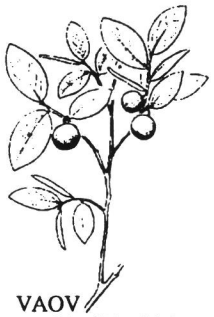
ALSI PLANT ASSOCIATION
Alnus sinuata
Sitka Alder

SW2132

No. Plots = 21







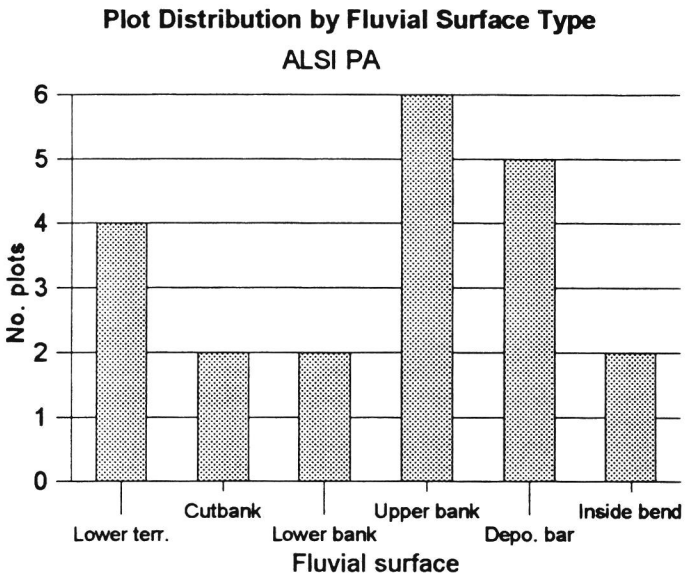
VEGETATION COMPOSITION AND STRUCTURE -- The ALSI plant association (PA) is a moderately dense to dense community of medium to tall shrubs, with a rather sparse forb understory. Canopy height in this sample varied between 10 and 20 feet. Conifer seedlings are often present and in some cases may be relatively abundant (up to 30% foliar cover). Moss cover is usually fairly well developed. Sitka alder (ALSI) is always present, usually as the dominant species of the community, and is generally accompanied by ovalleaf huckleberry (VAOV) and a suite of other moist-site shrubs, including prickly currant (RILA), stinkcurrant (RIBR), salmonberry (RUSP) and fool's huckleberry (MEFE). Thimbleberry (RUPA) and highbush cranberry (VIED) may be locally abundant. In the herbaceous layer, a mixture of moist-site forbs occurs, most commonly vanillaleaf (ACTR), ladyfern (ATFI), bunchberry dogwood (COCA), coolwort foamflower (TITRU) and twinflower (LIBO2). Seedlings of Pacific silver fir (ABAM) or western hemlock (TSHE) may be present. An average of 19.1 vascular plant species per plot occurred in this sample of the ALSI PA, with an average of 7.7 dominant species.

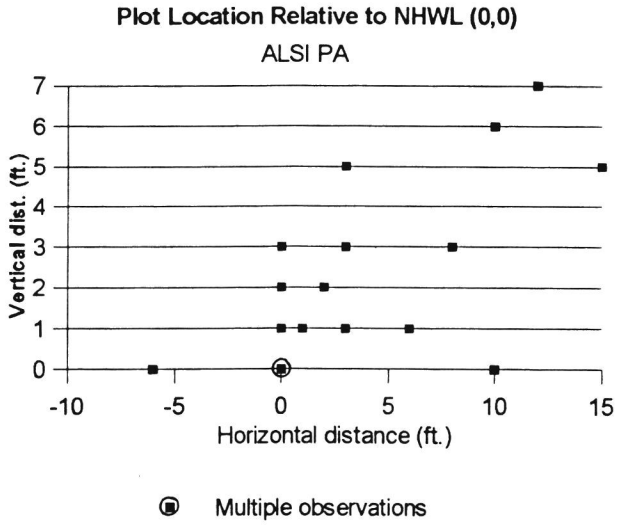
SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Abies amabilis	ABAM	35	10
Shrubs			
Alnus sinuata	ALSI	100	22
Menziesia ferruginea	MEFE	30	5
Ribes bracteosum	RIBR	50	15
Ribes lacustre	RILA	55	7
Rubus spectabilis	RUSP	50	5
Vaccinium ovalifolium	VAOV	75	15
Forbs			
Achlys triphylla	ACTR	70	6
Athyrium filix-femina	ATFI	65	8
Cornus canadensis	COCA	55	8
Linnaea borealis	LIBO2	50	7
Tiarella tri. var. unifol.	TITRU	55	2
Moss		38	18
Bare soil/sand		43	7
Gravel		48	17
Cobbles		71	21
Rock		71	18

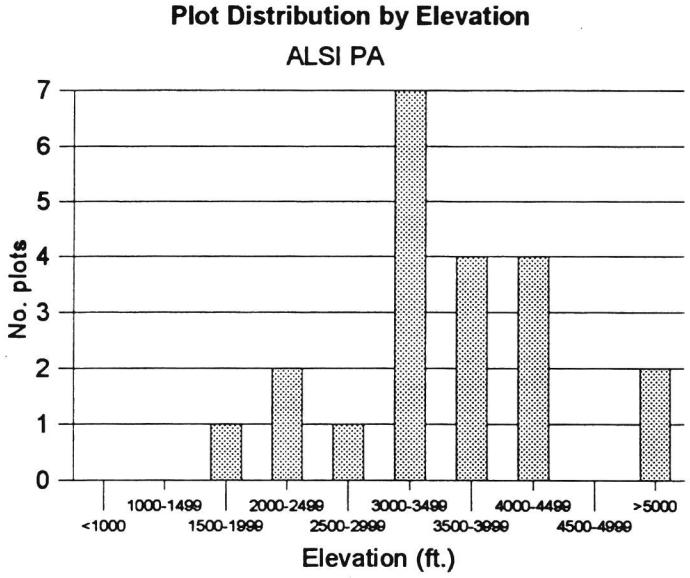
This is relatively high species diversity compared to riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The ALSI PA represents cool, moist sites, and in this sample occured in the upper portions of stream drainages throughout the study area at mid to high elevations. A similar plant community has been observed on the Mt. Baker-Snoqualmie National Forest to the north, and also farther south in the Cascades of Oregon on the Willamette National Forest; successional and environmental parallels to our ALSI PA have not been determined.

Two ecotypes are described from this sample of the ALSI PA. The ALSI Streambank ET occupies gently-sloping (rarely steep) upper streambanks and







terraces above (1-6 feet in this sample) the normal high-water line in the floodprone zone of steep to moderate gradient incised valleys (Rosgen A and B channel types). It typically forms a dense, brushy fringe of vegetation between the stream and the adjacent upland conifer forest. Substrates were a mixture of sand and silt, sometimes over gravel. There was little bare soil or rock at the surface, and profiles showed evidence of soil development and incorporation or organic matter. The second ecotype, the ALSI Cobble ET, occurs on cobble deposits at or just above the normal high-waterline. In this sample it was found in low-gradient headwaters (glaciated valleys?) and alluviated mountain valleys (Rosgen C channel types). Substrates in this sample were dominated by cobbles and boulders and there is significant unvegetated surface. The presence of Sitka alder indicates there is moisture in the rooting zone throughout the growing season, even though the rocky ground surface may be quite dry. These sites are more likely to be inundated than the ALSI Streambank ET, possibly as often as every few years.

MANAGEMENT IMPLICATIONS -- The ALSI PA probably represents the potential vegetation in sites where it occurs. It is tempting to hypothesize succession to a Pacific silver fir forest type based on the presence of seedlings (and scattered mature trees). But there is no evidence that Pacific silver fir eventually becomes a dominant feature of the plant community, possibly because of frequency of inundation or scarcity of suitable microsites for conifer establishment.

Lacking a significant mature conifer component, the ALSI PA contributes little as a source of large wood for the stream system, although the adjacent closed canopy conifer stand probably would. It does have the capability to offer significant shade to narrow streams, as well as considerable foliar input. The dense roots provide a degree of slope stabilization and protection from surface erosion. The presence of Sitka alder, a nitrogen fixer, enhances soil productivity, especially in the ALSI Cobble ET where the nutrient status of the substrate is likely to be very low. Floodplain types like the ALSI Cobble ET may significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

In the ALSI Streambank ET, ground disturbance has the potential to increase sedimentation from surface runoff over finer textured substrates. Sitka alder is a good candidate for site rehabilitation, as are ovalleaf huckleberry and stinkcurrant. Erosion is less likely to be a problem in the ALSI Cobble ET but site rehabilitation may be more challenging due to the rockiness of the substrate. Sitka alder is likely to be the easiest species to propagate in these sites.

WILDLIFE HABITAT RELATIONSHIPS -- The shrub/conifer seedling component of the ALSI PA provides structure for nest sites for birds and hiding and thermal cover for a variety of wildlife species. This PA has a wide diversity of berry producing shrubs. Huckleberries, salmonberry, currants, and buchberry dogwood all provide fruit for a wide variety of wildlife species including small birds, grouse, quail, small mammals, bear, fox and coyote. The seeds, buds, and catkins of Sitka alder provide important winter food for siskins, chickadees, and grouse. Small mammals, rabbits, and porcupine eat the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds. Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians.

The ALSI PA (especially the Cobble ET) is typically found in areas of gentle topography on cool moist sites that provide relief from summer heat for deer and elk. Alder, salmonberry, huckleberry and current all provide high quality browse. The forb understory provides small amounts of forage. Huckleberry, salmonberry, highbush cranberry and prickly currant provide browse for mountain goat at higher elevations.

The Cobble ET sites contribute toward the capability of an area to support beaver. Sitka alder provides food and building material for dams. Salmonberry, thimbleberry, and highbush cranberry provide additional food for beaver on sites where they occur. A beaver colony could be supported in the area only if the ALSI type is plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials. Any nearby willow or alder dominated sites would contribute to the capability of the area to support beaver.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ALSI PA is most commonly found adjacent to riparian communities that indicate cool, moist streambank environments (the Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV) and Brook Saxifrage-Arrowleaf Groundsel (SAAR4-SETR) types, for example) or saturated gravel/cobble surfaces in

the bankfull zone (the Yellow Monkeyflower (MIGU) and Coltsfoot (PEFR2) types).

UPLAND -- Pacific Silver Fir Zone plant associations (Hemstrom and others, 1982; Brockway and others, 1983) indicative of cool upland environments are characteristically adjacent to riparian sites with the ALSI PA. Some of the more common types are the Pacific Silver Fir/Rhododendron/Beargrass (ABAM/RHMA/XETE), Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE), Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL) and Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA) associations, as well as the Western Hemlock/Rhododendron-Dwarf Oregongrape (TSHE/RHMA-BENE; Halverson and others, 1986) association.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ALSI PA may be confused with the following types, and can be distinguished from them as noted below:

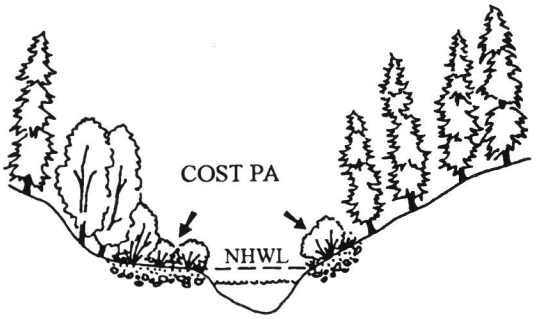
- ALIN-VAOV PA - lacks Sitka alder; dominated by mountain alder; herb layer is similar
- ALRU/TRCA3 PA - lacks Sitka alder; dominated by mountain alder; herb layer has false bugbane as a dominant
- VAAL-VAOV PA - lacks Sitka alder; herb layer is similar; occupies somewhat drier sites

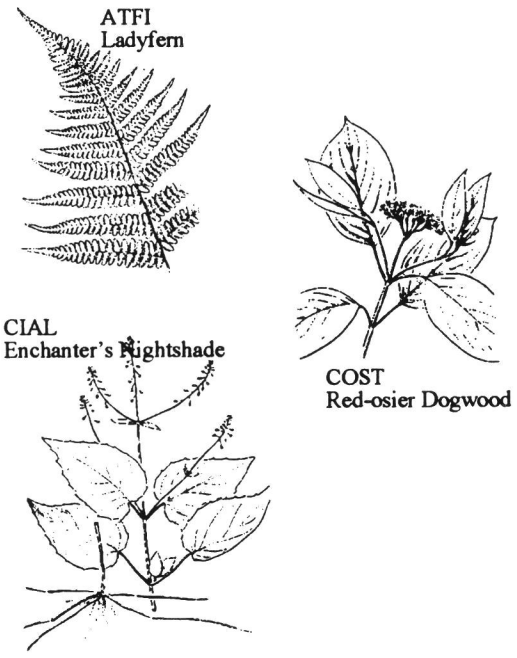
RELATIONSHIP TO OTHER CLASSIFICATIONS --Kovalchik (1992) has described two types in eastern Washington that are similar but not identical to the ALSI PA. His ALSI/ATFI association occurs in sites very similar to our ALSI Streambank ET, and his ALSI/Mesic Forb type parallels our ALSI Cobble Bar ET. But in both cases, species associated with the community dominants are different from ours, and the elevations of the eastern Washington types are considerably higher than ours in the Cascades.

COST PLANT ASSOCIATION
Cornus stolonifera
Red-osier Dogwood

SW4131

No. Plots = 14



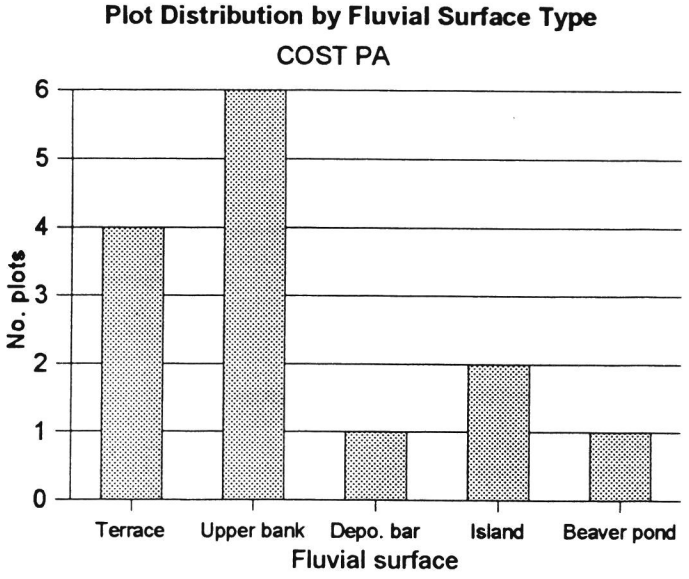


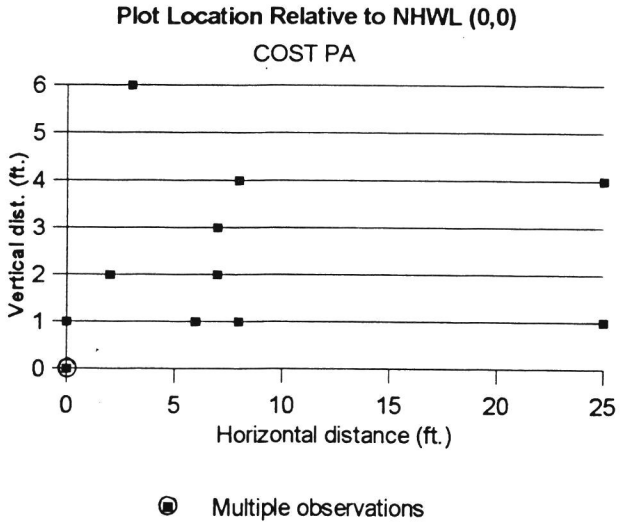
VEGETATION COMPOSITION AND STRUCTURE -- The COST plant association (PA) consists of a dense thicket of tall shrubs with a sparse to moderate understory of forbs, grasses and grasslike plants. Canopy height in this sample averaged between 8 and 12 feet. Moss cover is generally moderate to low. The plant community is dominated by red-osier dogwood (COST), sometimes in association with thimbleberry (RUPA) and vinemaple (ACCI). In the herbaceous layer, ladyfern (ATFI), Cooley's hedgenettle (STCO4) and enchanter's nightshade (CIAL) are often present, along with small amounts of sweet-scented bedstraw (GATR). Rushes (*Luzula* spp.), sedges (*Carex* spp.) and small-fruited bulrush (SCMI) may also occur. Small amounts of conifer seedlings (most often western hemlock (TSHE)) may be found as well. There was an average of 16.2 vascular plant species per plot in this sample of the COST PA, with an average of 3.9 dominant species. These are average values compared to riparian types overall.

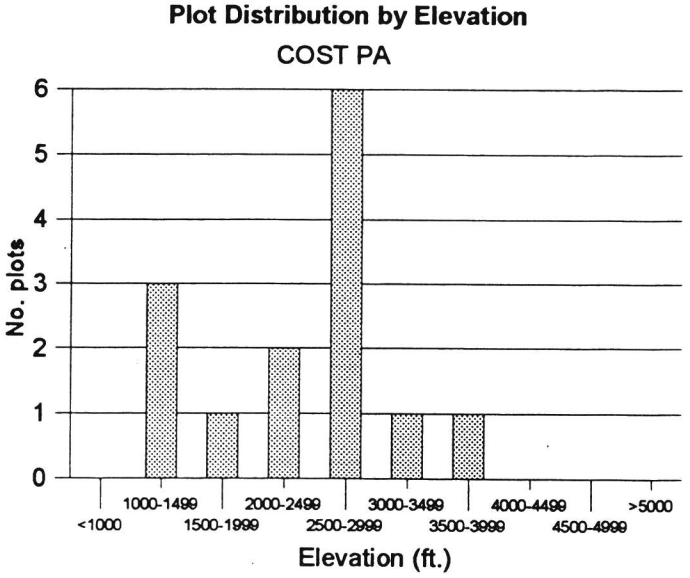
SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Tsuga heterophylla	TSHE	36	1
Shrubs			
Cornus stolonifera	COST	100	57
Rubus parviflorus	RUPA	36	7
Forbs			
Athyrium filix-femina	ATFI	43	6
Circaea alpina	CIAL	43	5
Galium triflorum	GATR	71	3
Stachys cooleyae	STCO4	43	6
Grasses/grasslikes			
Luzula parviflora	LUPA	36	2
Moss		79	16
Bare sand/soil		64	15
Gravel		21	15
Cobbles		50	25
Rock		29	13

ENVIRONMENT AND DISTRIBUTION -- The COST PA represents moist, well-drained sites with a

moderate to long growing season and infrequent inundation. One ecotype, the COST Streambank ET, is defined for this plant association. In this sample it occurred primarily on flat to sloping streambanks and terraces with finer-textured substrates (silts and sands) which sometimes blanketed a base layer of cobbles. On a few plots the substrate consisted exclusively of cobbles. Plots without the silt/sand layer tended to have a lower cover of forbs, but otherwise were similar in vegetation and environment to those with it. Many plots had significant (>10%) cover of bare sand or rock. The COST Streambank ET generally occurs as a narrow to rather wide "fringe" of vegetation between the stream and adjacent conifer stand, in the floodprone zone. Plots generally fell 0-4 feet above and within 10 lateral feet of the normal high-







water line, of mostly wide (>100'), alluviated channels (Rosgen C channel types, occasionally type B). The COST PA occurred mostly below 3000 feet in elevation, and was widespread in the study area, on both sides of the Cascades crest. A similar plant community has also been observed on the Mt. Baker-Snoqualmie National Forest in the Cascades of northern Washington, and farther south in the Cascades of Oregon on the Willamette National Forest; environmental and successional parallels to our type have not been established.

MANAGEMENT IMPLICATIONS -- The COST PA probably represents the potential vegetation for sites where it occurs.

Lacking a conifer component, it does not provide a source of large wood for the stream. Where the stream channel is narrow, the dense thicket of shrubs can offer significant shade, but probably shades only the periphery of the stream in the wider channels where it most commonly occurs. Red-osier dogwood plays a

major role in providing surface stability to streambanks and protection from erosion during low intensity floods, and also contributes abundant foliar material to the stream.

Sites with the COST PA may be susceptible to erosion if the surface is disturbed, but are likely to revegetate quickly, especially if the surface sand/silt layers remain. Red-osier dogwood, vinemaple and red alder (ALRU) are well-adapted to these sites and establish readily on open ground.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the COST PA provides nest sites for birds, and hiding and thermal cover for a variety of wildlife species. Red-osier dogwood and thimbleberry provide an important source of berries for songbirds, grouse, quail, small mammals, fox, bear and coyote.

The wide channels, flat topography, and lower elevations associated with the COST PA sites provide wintering areas for deer and elk. These riparian areas also provide cool areas for relief from summer heat. Browse is available year-round.

These sites contribute toward the capability of an area to support beaver. Red-osier dogwood and red alder (from adjacent types) provide building material for dams. Twigs and bark of red-osier dogwood and thimbleberry provide food for beaver. A beaver colony could be supported in the area only if the COST PA and adjacent red alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The COST PA was most commonly found in conjunction with red alder-dominated types (Red Alder/Thimbleberry (ALRU/RUPA), Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) and Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI), as well as the Cooley's Hedgenettle-Yellow Monkeyflower (STCO4-MIGU), Sitka Willow/Coltsfoot (SASI2/PEFR2) and Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) types.

UPLAND -- A variety of Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986), Grand Fir Zone (Topik and others, 1988) and lower Pacific Silver Fir Zone (Hemstrom and other, 1982; Brockway and others, 1983) plant associations indicative of warm, well-drained site conditions are found in proximity to the COST PA. The most common are the Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU), Western Hemlock/Dwarf Oregongrape (TSHE/BENE), Grand Fir/Twinflower (ABGR/LIBO2) and Pacific Silver Fir/Rhododendron-Dwarf Oregongrape (ABAM/RHMA-BENE) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The COST PA may be confused with the following types, and can be distinguished from them as noted below:

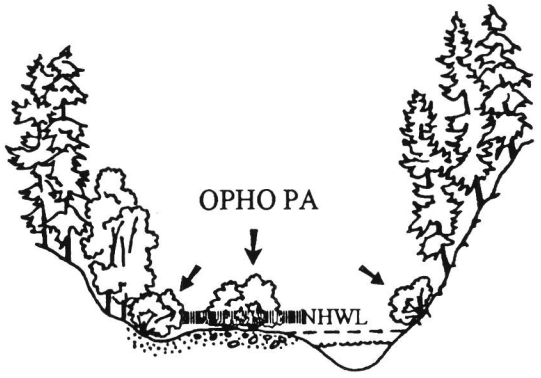
- ALRU/RUPA PC - thimbleberry and red alder are dominants
- STCO4/ATFI PA - lacks a well-developed shrub layer dominated by red-osier dogwood; herb layer is similar

RELATIONSHIP TO OTHER CLASSIFICATIONS -- COST types have been described in both eastern Oregon (Crowe and Clausnitzer, 1996) and eastern Washington (Kovalchik, 1992). In both cases, the type occurred at a wider range of elevations, in narrower stream channels, and had different associated species than our association.

OPHO PLANT ASSOCIATION
Oplopanax horridum
Devilsclub

SW7113

No. Plots = 29

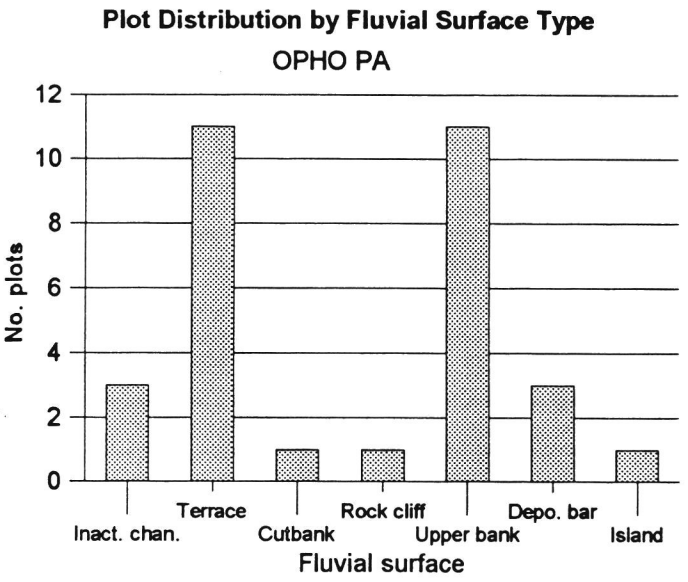


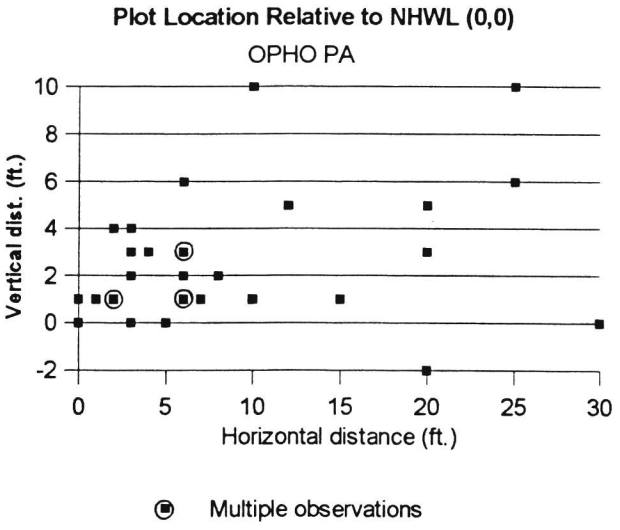
VEGETATION COMPOSITION AND STRUCTURE -- The OPHO plant association (PA) is a dense community of tall shrubs with a well-developed understory of forbs. In this sample, canopy height averaged between 4 and 8 feet. Moss is usually present but varies in abundance. Conifer seedlings are sometimes present in small amounts. The shrub layer is dominated by devilsclub (OPHO), usually accompanied by salmonberry (RUSP) and/or stinkcurrant (RIBR). A variety of moist-site herbs comprise the understory, most commonly oxalis (OXOR), oakfern (GYDR), ladyfern (ATFI) and hedgenettle (STCO4). Traces of western hemlock (TSHE) or other conifer regeneration may be present. There was an average of 14.1 vascular plant species per plot in this sample of the OPHO PA, with an average of 4.8 dominant species. These are somewhat lower-than-average values for riparian types overall.

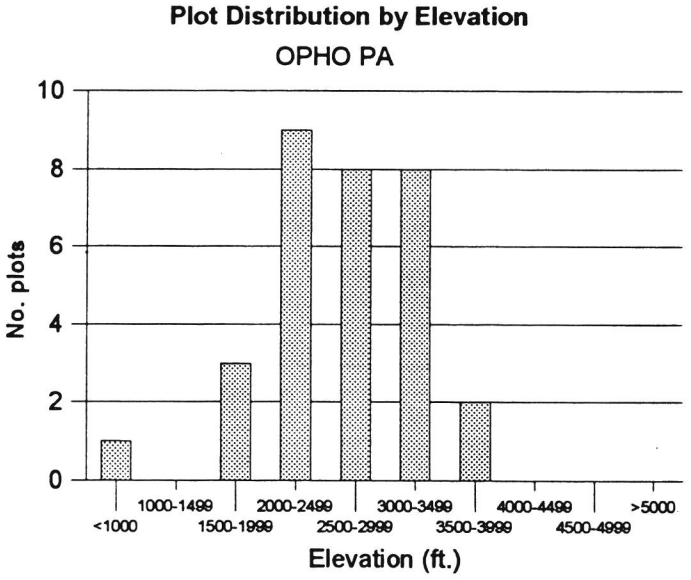
SPECIES	CODE	CONS.	%COV.
Shrubs			
Oplopanax horridum	OPHO	100	29
Ribes bracteosum	RIBR	62	21
Rubus spectabilis	RUSP	83	17
Forbs			
Athyrium filix-femina	ATFI	69	7
Gymnocarpium dryopteris	GYDR	66	9
Oxalis oregana	OXOR	48	19
Stachys cooleyae	STCO4	38	5
Moss		78	51
Bare sand/soil		55	20
Gravel		32	6
Cobbles		29	10
Rock		34	16

ENVIRONMENT AND DISTRIBUTION -- The OPHO PA represents sites with a moderately long growing season and saturated soils - seeps , springs and floodplain wetlands. Two ecotypes are described from this sample of the OPHO PA. The OPHO Steep Streambank ET occurs on sloping streambanks and cliffs (usually >=25% slope), with a variety of substrate

types, usually silt/sands, cobbles or cobble/gravel mixes. The substrate seems less of a controlling factor in the presence of this plant community than the year-round presence of water in the rooting zone. The OPHO Streambank/Terrace ET occurs on flat terraces, abandoned channels and streambanks, generally on saturated fine-textured substrates (silt and sand), or at least 20 cm. of silt/sand over cobbles. In this sample, the soils tended to be high in organic matter, and in some cases were classified as mucks or peat soils. The OPHO Streambank/Terrace ET is much more likely to have several distinct layers in the substrate, suggesting multiple depositional events, the most recent of which deposited substantial finer materials, and possibly occurred after the establishment of the current plant community.







Speculation that recurrent but infrequent inundation probably occurs in these sites is strengthened by the scarcity of conifer seedlings; barring disturbance, conifers should be able to become established where this association occurs. Both ecotypes were found in the floodprone zone, 0-10 feet above the normal high-water line and from very near the stream to several yards away. Our plots in this sample were located at moderate elevations throughout the study area, most commonly on the west side of the Cascades crest, in all types of channels (incised to alluviated mountain valleys, Rosgen A, B and C channel types). A similar plant community has been observed on the Olympic Peninsula, in the northern Washington Cascades, and farther south in the Cascades of Oregon, but their environmental and successional parallels with the OPHO PA have not been established.

MANAGEMENT IMPLICATIONS -- The OPHO PA probably represents the potential vegetation in sites where it occurs, given the hydrologic regime.

Lacking a mature conifer component, the OPHO PA does not contribute large wood to the stream. In smaller channels, it may provide some shade if it is immediately adjacent to the water's edge. Foliar input to the stream may be considerable, and shrub roots, particularly salmonberry, help anchor the substrate and protect against surface erosion. Floodplain types like the OHO Streambank/Terrace ET may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface, and reducing downstream effects to landforms and vegetation.

These are sites that may, between high flow events, experience low intensity inundation every few years. This type of flooding may deposit small amounts of debris and fine-textured alluvium, without significantly disrupting the plant community. The two ecotypes probably would respond somewhat differently to ground disturbance. The steeper slopes of the OPHO Steep Streambank ET, having finer-textured soils, carry a risk of erosion and sedimentation. Because these are "seepy" sites with a high water table, ground disturbance could cause surface flows to increase significantly. Where the OPHO Streambank/Terrace ET occurs, the risk of sedimentation is less, but loss of structure and productivity in the saturated, fine-textured, highly organic soils is a real possibility. Artificial re-establishment of vegetation in these sites is likely to be challenging due to wet soils, but on the other hand, salmonberry is likely to reinvade vigorously, especially if it is present in adjacent undisturbed areas.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer of the OPHO PA provides nest sites for small birds and hiding cover for birds and small mammals. Salmonberry and devilsclub produce berries that are eaten by small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine consume the twigs and bark of salmonberry.

The Streambank/Terrace ET on flat terraces provides cool resting sites for deer and elk. Spring and summer forage is available in moderate amounts and quality.

Seeps and springs, often associated with the OPHO PA, provide unique habitat for some wildlife species including salamanders, frogs, garter snakes, and several species of shrews and voles. If down wood or boulders are present, VanDyke's salamander (*Plethodon vandykei*) and/or Dunn's salamander (*P. dunni*) may occur. Both species are listed as species of concern by the State of Washington.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The OPHO PA in this sample was found with a wide variety of riparian types that indicate wet environments. The most common were the Stinkcurrant-Salmonberry/Ladyfern (RIBR-RUSP/ATFI) and coltsfoot (PEFR2) types, followed by several red alder (ALRU) types, especially Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME), Red Alder/Salmonberry/Oxalis (ALRU/RUSP/OXOR) and Red Alder/Devilsclub (ALRU/OPHO).

UPLAND -- Moist-site, productive, species-rich upland Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations most frequently occurred adjacent to the OPHO PA. The most common was the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) association, followed by Western Hemlock/Devilsclub (TSHE/OPHO), Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA), Pacific Silver Fir/Devilsclub (ABAM/OPHO) and Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR)

SIMILAR RIPARIAN TYPES IN THIS AREA -- The OPHO PA may be confused with the following

types, and can be distinguished from them as noted below:

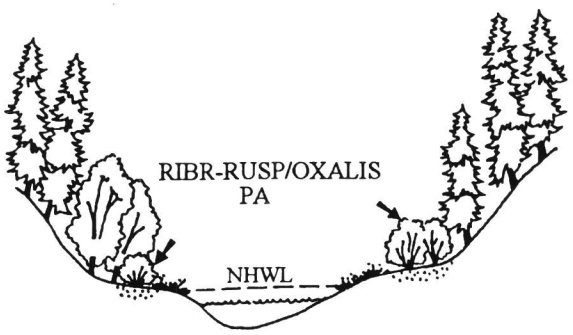
- □ THPL/RUSP/OXALIS PC - conifers are dominant; lacks devilsclub as a dominant
- □ ALRU/OPHO PC - red alder is dominant
- □ ALRU/OXALIS PC - red alder is dominant; lacks devilsclub as a dominant
- □ RUSP-RIBR/ATFI PA - devilsclub is not dominant; herb layer is similar
- □ OXALIS PA - herb layers may be similar, but well-developed shrub layer is lacking
- □ STCO4/ATFI PA - "

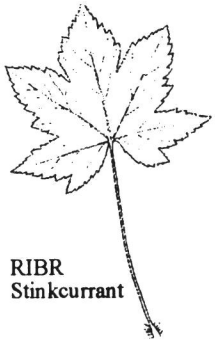
RELATIONSHIP TO SIMILAR CLASSIFICATIONS - This type has not been described elsewhere in the Pacific Northwest.

RIBR-RUSP/OXALIS PLANT ASSOCIATION
Ribes bracteosum-Rubus spectabilis/Oxalis spp.
Stinkcurrant-Salmonberry/Oxalis

SW5121

No. Plots = 13



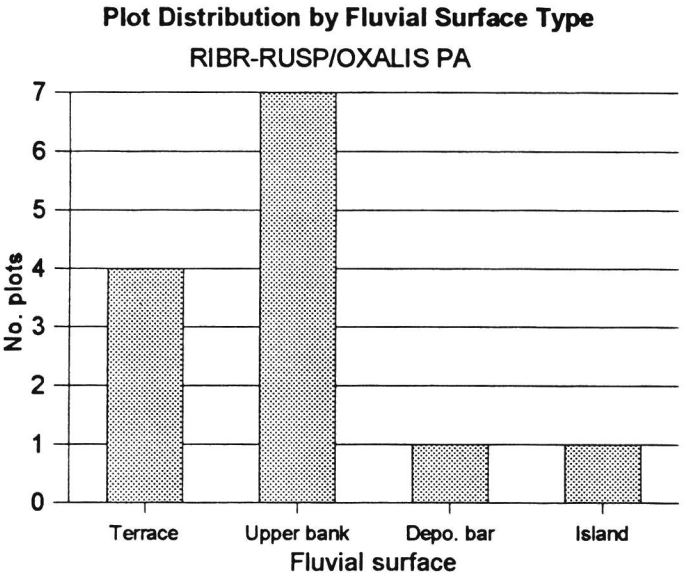


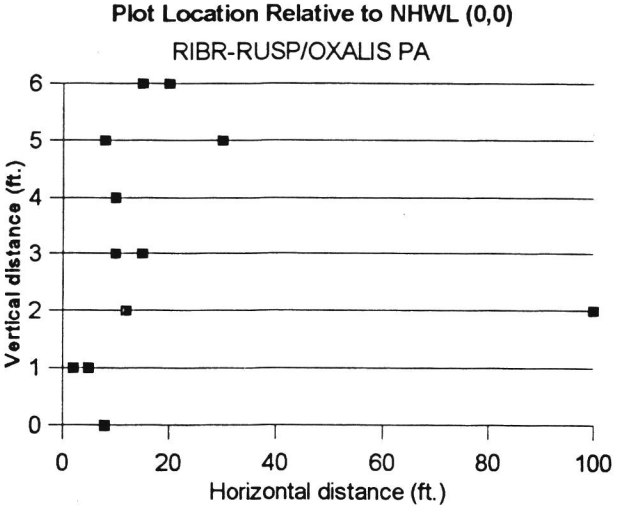
VEGETATION COMPOSITION AND STRUCTURE -- The RIBR-RUSP/OXALIS plant association (PA) consists of a dense layer of tall and low shrubs with a diverse and well-developed understory of herbaceous plants. Canopy height in this sample usually fell between 5 and 10 feet. Moss cover in this type is variable. The dominant shrubs are moisture-loving species, primarily stinkcurrant (RIBR) and salmonberry (RUSP). Oxalis (OXTR, OXOR) is nearly always dominant, and frequently accompanied by varying amounts of ladyfern (ATFI) and swordfern (POMU). In some locations, Scouler's corydalis (COSC) or Cooley's hedgenettle (STCO4) may be quite abundant as well. Small amounts of sweetscented bedstraw (GATR) and Siberian miner's lettuce (MOSI) are common. There was an average of 17.8 vascular plant species per plot in this sample of the RIBR-RUSP/OXALIS PA, with an average of 5.1 dominant species. These are average values compared to riparian types overall.

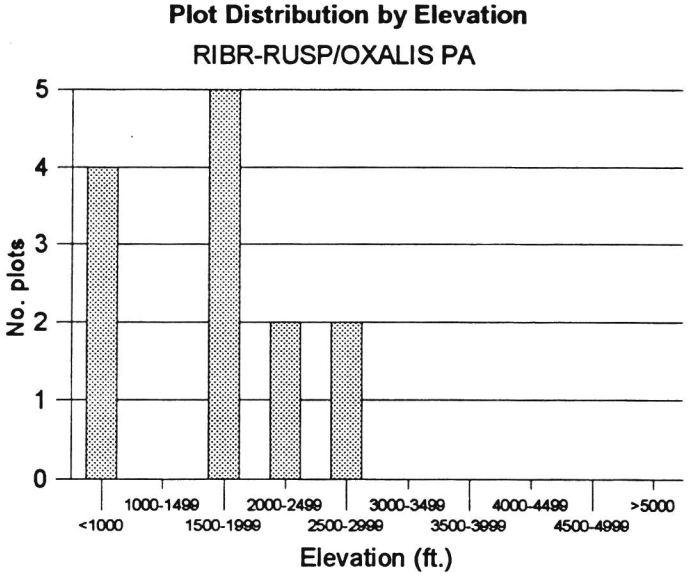
ENVIRONMENT AND DISTRIBUTION -- The RIBR-RUSP/OXALIS PA represents moist riparian sites with a long to moderately long growing season,

SPECIES	CODE	CONS.	%COV.
Shrubs			
Ribes bracteosum	RIBR	69	40
Rubus spectabiis	RUSP	92	26
Forbs			
Athyrium filix-femina	ATFI	100	9
Corydalis scouleri	COSC	54	18
Galium triflorum	GATR	77	2
Montia sibirica	MOSI	62	2
Oxalis oregana	OXOR	85	30
Oxalis trilliifolia	OXTR	8	50
Polystichum munitum	POMU	77	8
Stachys cooleyae	STCO4	46	4
Tolmiea menziesii	TOME	69	8
Grasses/grasslikes			
Unidentified grasses	GRAMI	62	3
Moss		92	26
Bare sand/soil		54	2
Gravel		23	10
Cobbles		46	12
Rock		54	41

and generally finer-textured substrates. One ecotype, the RIBR-RUSP/OXALIS Streambank-Terrace ET, is defined from this sample. It was found primarily on gently sloping (rarely steep) upper streambanks and terraces in the floodprone zone of alluviated mountain valleys (Rosgen B and C channel types), averaging 1 to 6 feet above and within 20 horizontal feet of the normal high-water line. Substrates generally consisted of deep deposits of silt, sand or volcanic ash, occasionally over a base layer of cobbles. One small set of plots fell within a deeply incised, steep gradient valley (Rosgen channel type A) and had a substrate consisting primarily of cobbles. The RIBR-RUSP/OXALIS PA occurs widely throughout the study area west of the Cascade crest at low to moderate elevations. A similar plant community has been observed on the







Olympic Peninsula, in the northern Cascades of Washington, and farther south in the Cascades of Oregon; environmental and successional parallels to our RIBR-RUSP/OXALIS PA have not been established.

MANAGEMENT IMPLICATIONS -- The RIBR-RUSP/OXALIS PA probably represents the potential vegetation in sites where it occurs.

Lacking a mature conifer component, this type does not contribute large wood to the stream. Where it is relatively close to the water's edge, it may provide significant shade and foliar input. The shrub roots (especially of salmonberry) help stabilize streambanks and prevent surface erosion. Floodplain communities like the RIBR-RUSP/OXALIS PA may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface and reducing downstream effects to landforms and vegetation.

Sites with the RIBR-RUSP/OXALIS PA are likely to be relatively resilient to moderate ground disturbance, except where the substrate has a high proportion of silt or clay (and a related risk of soil compaction or erosion/sedimentation). As long as there is adequate moisture in the substrate, species such as stinkcurrant and salmonberry should proliferate quickly (as may red alder if there is sufficient light), whether through natural reinvasion or planting. In the early stages of succession on very open sites, abundant red alder may be a prominent feature of the plant community (see the discussion of the ALRU/RUSP/OXALIS PC). However, shade from surrounding vegetation or topography may inhibit red alder growth. These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the RIBR-RUSP/OXALIS PA provides structure for nest sites for birds and hiding cover for a variety of wildlife species. The presence of vinemaple may enhance nesting habitat on some sites. Salmonberry and stinkcurrant produce berries eaten by small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine consume the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

Those RIBR-RUSP/OXALIS PA sites that occur in areas with wide channels, flat topography, and at lower elevations, provide wintering areas for deer and elk. These riparian areas also provide cooler areas for relief from summer heat. Salmonberry provides low-quality winter and high-quality summer browse for deer and elk. The herbaceous layer provides year-round forage.

Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- A variety of riparian types indicating wet or moist conditions occurred in combination with the RIBR-RUSP/OXALIS PA in this sample. The most common were the Coltsfoot (PEFR2), Devilsclub (OPHO), Maidenhair Fern (ADPE), Cooley's Hedgenettle-Yellow Monkeyflower (STCO4-MIGU), Red Alder/Salmonberry/Oxalis (ALRU/RUSP/OXALIS) and Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME) types.

UPLAND -- The RIBR-RUSP/OXALIS PA commonly occurred adjacent to Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) upland plant associations indicative of moist, productive conditions. By far the most common was the Western Hemlock/Swordfern-Oregon Oxalis (TSHE/POMU-OXOR) association, followed by the Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) and Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The RIBR-RUSP/OXALIS PA may be confused with the following types, and can be distinguished from them as noted below:

- THPL/RUSP/OXALIS PC - has a well-developed tree layer dominated by conifers
- ALRU/OPHO PC - red alder and devilsclub are dominant
- ALRU/OXALIS PC - has a well-developed tree layer dominated by red alder

- ALRU/RUSP/OXALIS PC - red alder is a dominant
- OPHO PA - devilsclub is dominant; herb layer is similar
- RIBR-RUSP/TOME PA - lacks oxalis as a dominant
- RIBR-RUSP/PEFR2 PA - herb layer dominated by coltsfoot

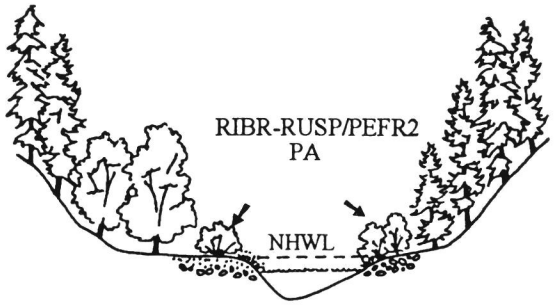
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The RIBR-RUSP/OXALIS PA has not been described elsewhere in the Pacific Northwest.

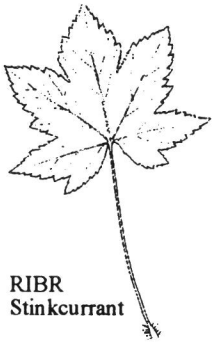
RIBR-RUSP/PEFR2 PLANT ASSOCIATION

SW5122

Ribes bracteosum-Rubus spectabilis/Petasites frigidus
Stinkcurrant-Salmonberry/Coltsfoot

No. Plots = 15



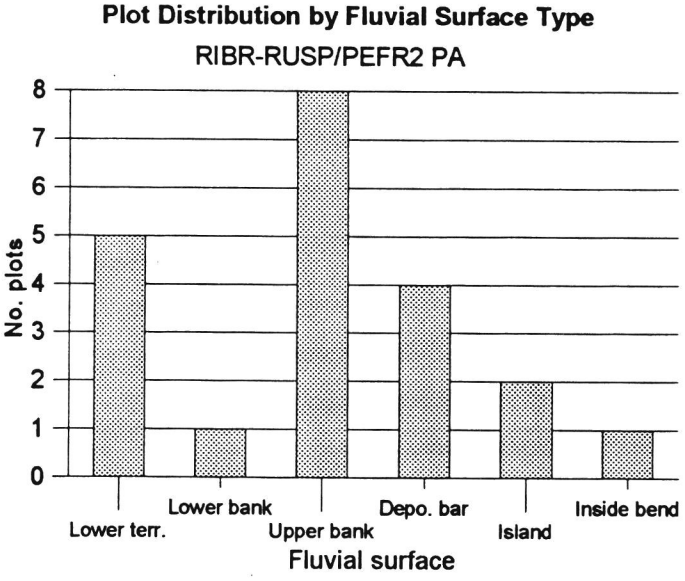


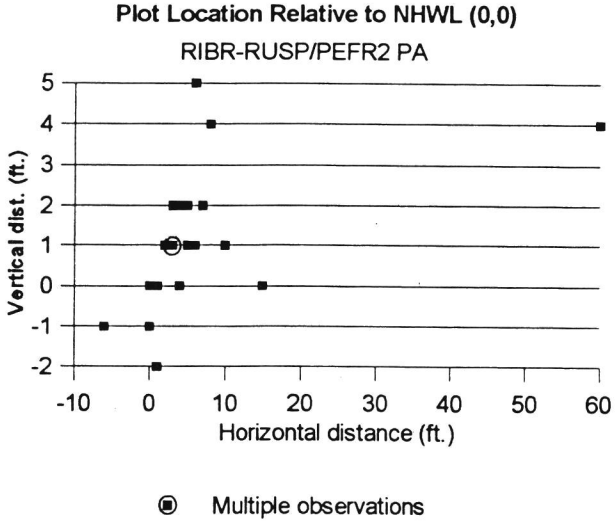
VEGETATION COMPOSITION AND STRUCTURE -- The RIBR-RUSP/PEFR2 plant association (PA) consists of a moderately dense community of medium-tall shrubs with a dense understory of forbs and grasses. Canopy height in this sample averaged between 3 and 5 feet. Moss is generally present, with low to moderate cover. Small amounts of conifer seedlings may be present. The dominant shrubs are stinkcurrant (RIBR) and salmonberry (RUSP). Coltsfoot (PEFR2) dominates the herbaceous layer, and is commonly associated with lesser amounts of ladyfern (ATFI), Cooley's hedgenettle (STCO4) and other moist-site herbs. Seedlings of western redcedar (THPL) and western hemlock (TSHE) may be present. There was an average of 17.7 vascular plant species per plot in this sample of the RIBR-RUSP/PEFR2 PA, with an average of 6.0 dominant species. These are average values compared with riparian types overall.

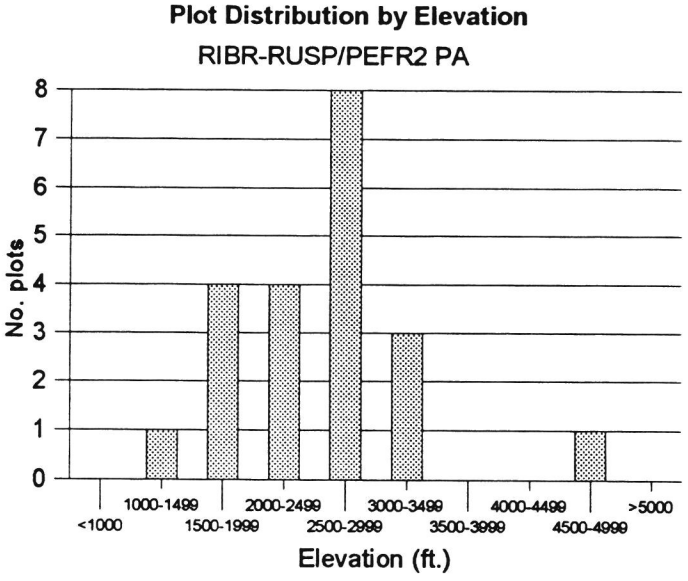
SPECIES	CODE	CONS.	%COV.
Shrubs			
Ribes bracteosum	RIBR	90	24
Rubus spectabilis	RUSP	80	13
Forbs			
Athyrium filix-femina	ATFI	60	5
Petasites frigidus	PEFR2	95	15
Stachys cooleyae	STCO4	47	8
Moss		87	29
Bare sand/soil		47	8
Gravel		47	12
Cobbles		33	29
Rock		33	10

ENVIRONMENT AND DISTRIBUTION -- The RIBR-RUSP/PEFR2 PA represents wet sites with a moderately long growing season. Two ecotypes are described from this sample. The RIBR-RUSP/PEFR2 Cobble ET occured on flat to gently-sloping depositional bars, islands and lower streambanks, within or barely above the bankfull zone. The substrates were very coarse, consisting of cobbles or cobble/gravel

mixes, with little organic material. The RIBR-RUSP/PEFR2 Streambank/Terrace ET was found on flat (rarely steep) upper streambanks and terraces in the floodprone zone 1-2 feet above and <= 5 feet away from the normal high-water line. Substrates were finer-textured sands and silts, sometimes forming a layer several cm. thick over cobbles. Often 3 or 4 distinct layers were visible, suggesting multiple depositional events. Both ecotypes occur, often as a rather narrow fringe of shrubby vegetation, in a variety of channel types, ranging from narrow to wide, incised to alluviated (Rosgen A, B and C channel types). The RIBR-RUSP/PEFR2 PA occurs widely throughout the study area west of the Cascades crest, mostly at moderate elevations (although the range is wide). A similar community has been observed farther south







in the Cascades of Oregon on the Willamette National Forest, but environmental and successional parallels to our type have not been established.

MANAGEMENT IMPLICATIONS -- The RIBR-RUSP/PEFR2 PA probably represents the potential vegetation on sites where it occurs. The frequency of inundation likely inhibits establishment and growth of conifer seedlings.

Lacking a mature conifer component, the RIBR-RUSP/PEFR2 PA does not contribute significantly to large wood in the stream. Shrubs, especially salmonberry and red alder, provide bank stability and protection from surface erosion, and some degree of shade (especially in narrow stream channels) and foliar material to the stream. Floodplain communities like the RIBR-RUSP/PEFR2 PA may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface and reducing

downstream effects to landforms and vegetation.

Sites with the RIBR-RUSP/PEFR2 PA are likely to be relatively resilient to moderate ground disturbance. As long as there is adequate moisture in the substrate, species such as stinkcurrant and salmonberry should proliferate quickly (as may red alder if there is sufficient light), whether through natural reinvasion or planting. In the early stages of succession on very open sites, abundant red alder may be a prominent feature of the plant community (see the discussion of the ALRU/RUSP/PEFR2 PC). However, shade from surrounding vegetation or topography may inhibit red alder growth. Cobble-dominated sites may take considerable time to recover vegetation after a disturbance. These are sites that may, between high flow events, experience low intensity inundation every few years or decades, or even seasonally in the case of the RIBR-RUSP/PEFR2 Cobble ET. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community.

WILDLIFE HABITAT RELATIONSHIPS -- The moderately dense community of shrubs in the RIBR-RUSP/PEFR2 PA provides nest sites for small birds and hiding and thermal cover for a variety of wildlife species. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

Salmonberry and stinkcurrant produce berries eaten by small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine consume the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

The wide channels, and flat topography, associated with the RIBR-RUSP/PEFR2 PA provide wintering areas for deer and elk when they occur at lower elevations. These riparian areas also provide cooler areas for relief from summer heat. Salmonberry provides winter browse for deer and elk. Salmonberry and the herbaceous layer provide spring and summer forage.

Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians. Moss also provides habitat for insects.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The RIBR-RUSP/PEFR2 PA in this sample generally occurred adjacent to riparian types indicative of wet or cool/moist conditions. The most common were the Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV), Coltsfoot (PEFR2), Yellow Monkeyflower (MIGU) and Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) types, as well as a number of red alder-dominated communities.

UPLAND -- Several lower Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) and Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) upland plant associations that represent moist, productive environments were found in conjunction with the RIBR-RUSP/PEFR2 PA in this sample. The most frequently-encountered associations were Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL), Western Hemlock/Alaska Huckleberry/Oxalis (TSHE/VAAL/OXOR), Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) and Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The RIBR-RUSP/PEFR2 PA may be confused with the following types, and can be distinguished from them as noted below:

- ALRU/PEFR2 PC - lacks a well-developed shrub layer; red alder is dominant; more often in

bankfull zone

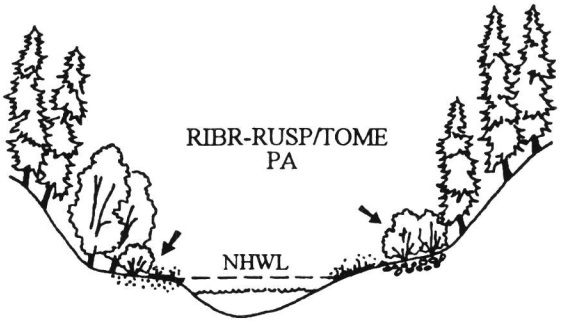
- □ RIBR-RUSP/OXALIS PA - coltsfoot is not dominant; slightly drier sites
- □ RIBR-RUSP/TOME PA - "
- □ PEFR2 PC - lacks a well-developed shrub layer
- □ SASI2/PEFR2 - Sitka willow is dominant; salmonberry and stinkcurrant not dominant

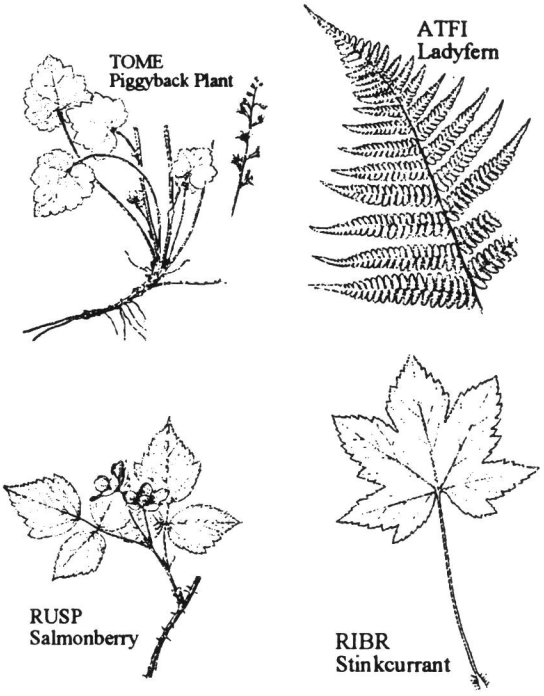
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The RIBR-RUSP/PEFR2 PA has not been described elsewhere in the Pacific Northwest.

RIBR-RUSP/TOME PLANT ASSOCIATION **SW5123**

Ribes bracteosum-Rubus spectabilis/Tolmiea menziesii
Stinkcurrant-Salmonberry/Piggyback Plant

No. Plots = 6



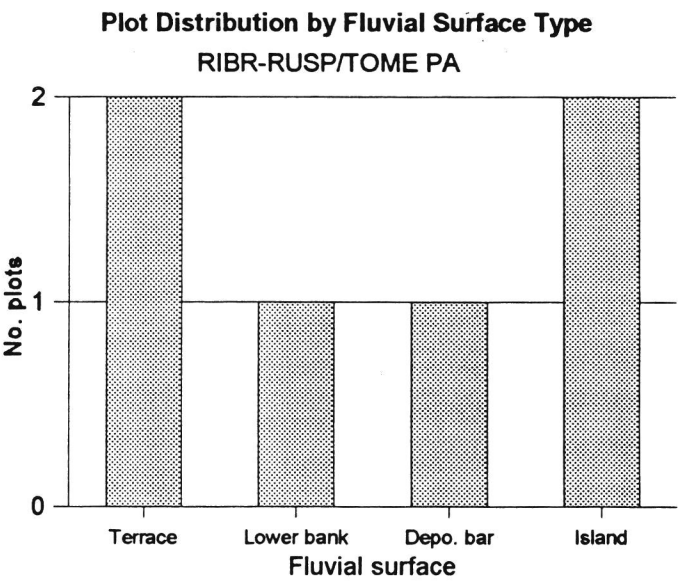


VEGETATION COMPOSITION AND STRUCTURE -- The RIBR-RUSP/TOME plant association (PA) has a dense shrub layer and a well-developed understory of herbaceous plants. Canopy height in this sample averaged between 6 and 12 feet. Moss cover is variable. The dominant shrubs are salmonberry (RUSP) and stinkcurrant (RIBR); significant amounts of thimbleberry (RUPA), Indian plum (OECE) and vinemaple (ACCI) may be present as well. The forb layer is dominated by piggyback plant (TOME) and/or ladyfern (ATFI), often along with enchanter's nightshade (CIAL), Cooley's hedgenettle (STCO4), Siberian miner's lettuce (MOSI) and small amounts of sweetscented bedstraw (GATR). There was an average of 18.7 vascular plant species per plot in this sample of the RIBR-RUSP/TOME PA, with an average of 5.5 dominant species. These are moderately high values compared to riparian types overall.

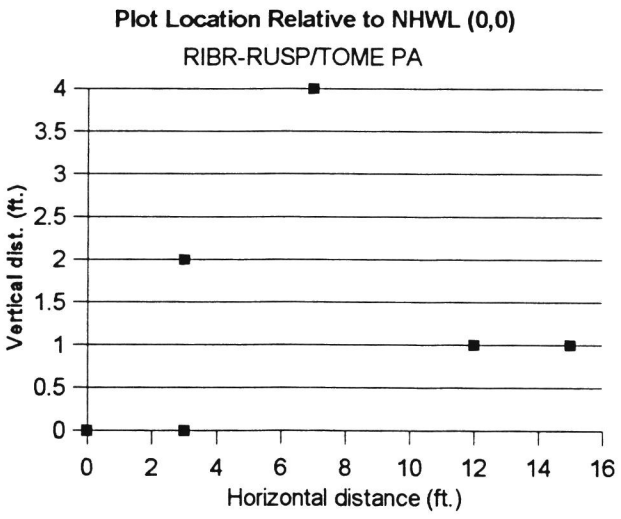
ENVIRONMENT AND DISTRIBUTION -- The RIBR-RUSP/TOME PA represents very moist riparian sites with a moderately long growing season. One ecotype, the RIBR-RUSP/TOME Terrace-Streambank ET, is defined from this sample. It occurred on gently

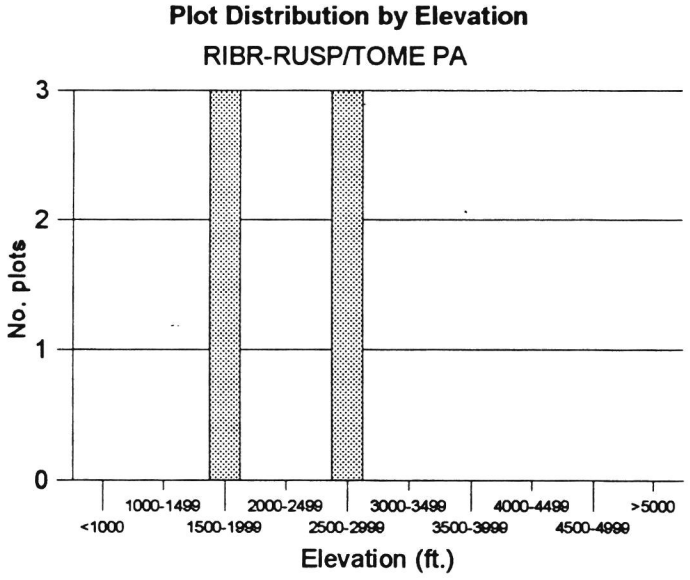
SPECIES	CODE	CONS.	%COV.
Shrubs			
Ribes bracteosum	RIBR	83	17
Rubus spectabiis	RUSP	100	25
Forbs			
Athyrium filix-femina	ATFI	67	28
Circaea alpina	CIAL	67	11
Galium triflorum	GATR	100	5
Montia parvifolia	MOPA	67	1
Montia sibirica	MOSI	67	5
Stachys cooleyae	STCO4	67	7
Tolmiea menziesii	TOME	83	14
Grasses/grasslikes			
Unidentified grasses	GRAMI	67	5
Moss		83	41
Bare sand/soil		50	4
Gravel		67	6
Cobbles		50	25
Rock		67	46

sloping islands and terraces within the floodprone zone of alluviated mountain valleys and incised, moderate-gradient valleys with some degree of floodplain development (Rosgen B and C channel types), generally 0 to 4 feet above and 3 to 15 feet horizontal distance from the normal high-water line. Substrates were generally a single layer of alluvial sands or cobbles, suggesting a single depositional event. This association was found in widely scattered locations in the western portion of the study area at mid-elevations. A similar plant community has been observed farther south in the Cascades of Oregon on the Willamette National Forest, but successional and environmental parallels to our type have not been established.



MANAGEMENT IMPLICATIONS -- The RIBR-RUSP/TOME PA probably represents the potential vegetation in sites where it occurs.





Lacking a mature conifer component, this type does not contribute large wood to the stream. Where it is relatively close to the water's edge, it may provide significant shade and foliar input. The shrub roots (especially of salmonberry) help stabilize streambanks and prevent surface erosion. Floodplain communities like the RIBR-RUSP/TOME PA may also significantly reduce stream velocity during periods of flooding, both causing onsite aggradation of the fluvial surface and reducing downstream effects to landforms and vegetation.

Sites with the RIBR-RUSP/TOME PA are likely to be relatively resilient to moderate ground disturbance,

except where the substrate has a high proportion of silt or clay (and a related risk of soil compaction or erosion/sedimentation). As long as there is adequate moisture in the substrate, species such as stinkcurrant and salmonberry should proliferate quickly (as may red alder if there is sufficient light), whether through natural reinvasion or planting. In the early stages of succession on very open sites, abundant red alder may be a prominent feature of the plant community (see the discussion of the ALRU/RUSP/TOME PC). However, shade from surrounding vegetation or topography may inhibit red alder growth. These are sites that may, between high flow events, experience low intensity inundation every few years or decades. This type of flooding may deposit small amounts of debris and fine-textured alluvium without significantly disrupting the plant community.

WILDLIFE HABITAT RELATIONSHIPS -- The dense shrub layer in the RIBR-RUSP/TOME PA provides structure for nest sites for birds and hiding cover for a variety of wildlife species. The presence of vinemaple may enhance nesting habitat on some sites. Salmonberry and stinkcurrant produce berries eaten by small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine consume the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

Those RIBR-RUSP/TOME PA sites that occur in areas with wide channels, flat topography, and at lower elevations, provide wintering areas for deer and elk. These riparian areas also provide cooler areas for relief from summer heat. Salmonberry provides low-quality winter and high-quality summer browse for deer and elk. The herbaceous layer provides year-round forage.

Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians. Islands provide resting spots for waterfowl that offer some protection from mammalian predators.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- A variety of riparian types indicating wet or moist conditions occurred in combination with the RIBR-RUSP/TOME PA in this sample. The most common were the Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS), Coltsfoot (PEFR2), Devilsclub (OPHO), and Cooley's Hedgenettle-Yellow Monkeyflower (STCO4-MIGU) types.

UPLAND -- The RIBR-RUSP/OXALIS PA commonly occurred adjacent to Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) upland plant associations indicative of moist, productive conditions. By far the most common was the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) association, followed by the Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR) and Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The RIBR-RUSP/TOME PA may be confused with the following types, and can be distinguished from them as noted below:

- ALRU/OPHO PC - dominated by red alder and devilsclub
- ALRU/RUSP/TOME PC - has a well-developed tree layer dominated by red alder
- ALRU/TOME-MOSI PC - dominated by red alder; lacks dominance of salmonberry & stinkcurrant
- OPHO PA - devilsclub is dominant; herb layer is similar

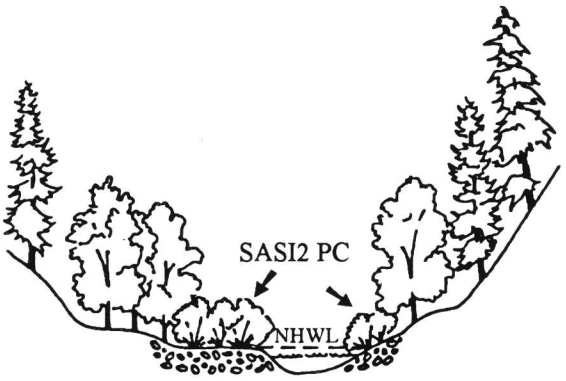
- □ RIBR-RUSP/OXALIS - has oxalis as a dominant; slightly drier sites
- □ RIBR-RUSP/PEFR2 - has coltsfoot as a dominant; slightly wetter sites

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The RIBR-RUSP/TOME PA has not been described elsewhere in the Pacific Northwest.

SASI2 PLANT COMMUNITY **SW1131**

Salix sitchensis
Sitka Willow

No. Plots = 7



SAS12
Sitka Willow

EQAR
Common Horsetail

ELGL
Blue Wildrye

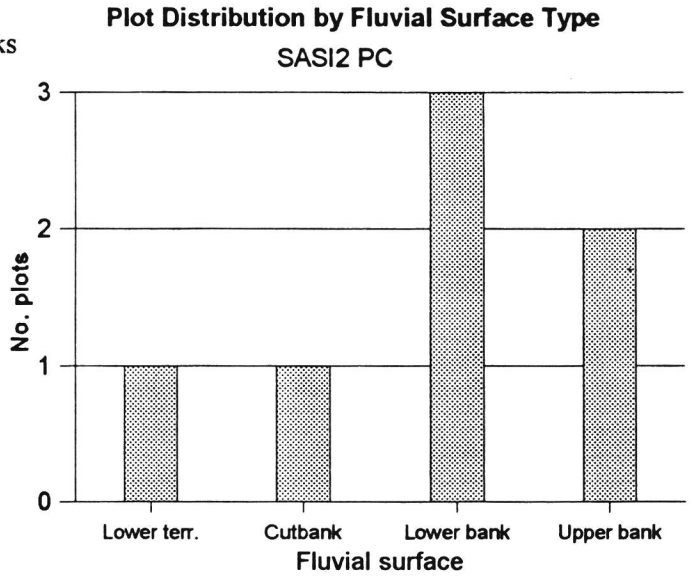
ALRU
Red Alder

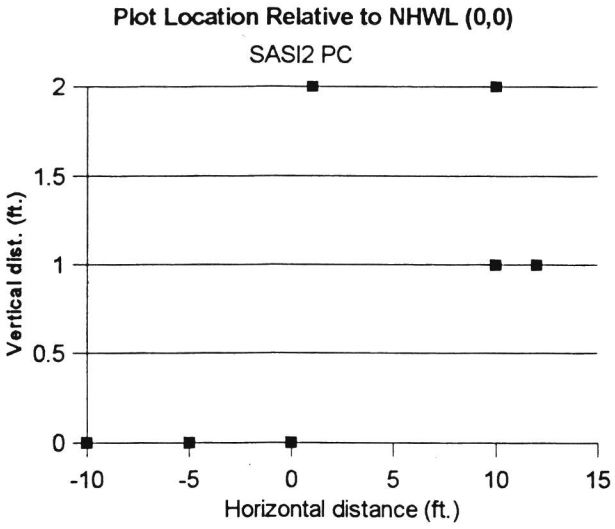
VEGETATION COMPOSITION AND STRUCTURE -- The SASI2 plant community (PC) is a moderate to dense community of medium to tall shrubs, with a meager to moderately-developed understory of forbs and grasses. Canopy height in this sample averaged <= 15 ft. Scattered mature deciduous trees are sometimes present. Moss cover is generally low. Sitka willow (SASI2) is the dominant shrub, sometimes along with lesser amounts of shrub-form red alder (ALRU) and black cottonwood (POTR2). Mature red alder may also be present, but the canopy is always very open. In the understory, small amounts of common horsetail (EQAR), wall-lettuce (LAMU), Siberian miner's lettuce (MOSI), pearly everlasting (ANMA) and Cooley's hedgenettle (STCO4) are often found. There was an average of 16.1 vascular plant species per plot in this sample of the SASI2 PC, with an average of 5.1 dominant species. These are average values for riparian types overall.

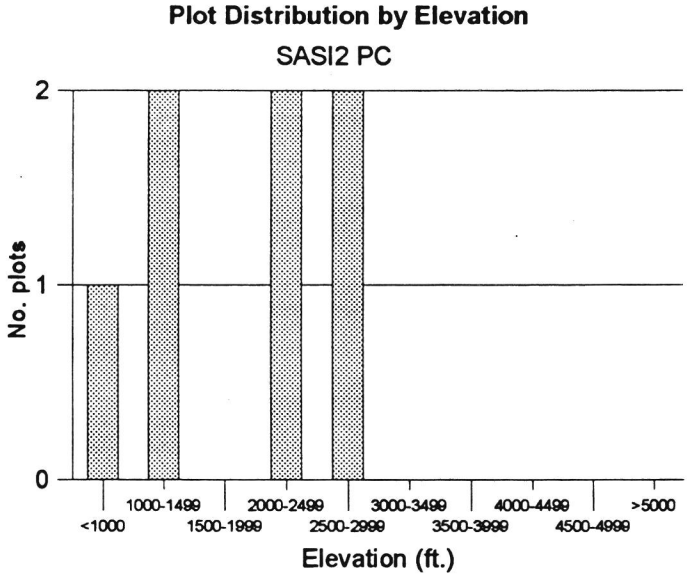
ENVIRONMENT AND DISTRIBUTION -- The SASI2 PC represents riparian sites, probably frequently inundated, with a relatively long growing season and

SPECIES	CODE	CONS.	%COV.
Trees (mature)			
Alnus rubra	ALRU	57	30
Trees (regen.)			
Alnus rubra	ALRU	57	6
Shrubs			
Salix sitchensis	SASI2	86	42
Forbs			
Anaphalis margaritacea	ANMA	43	2
Equisetum arvense	EQAR	57	3
Lactuca muralis	LAMU	43	3
Montia sibirica	MOSI	43	4
Stachys cooleyae	STCO4	43	2
Grasses/grasslikes			
Elymus glaucus	ELGL	57	3
Moss		43	7
Bare soil/sand		71	27
Gravel		57	13
Cobbles		71	37
Rock		71	6

coarse, moist substrates. In this sample, it occurred on gently sloping (rarely steep) terraces and streambanks composed of coarse-textured alluvium (sands, gravels and cobbles), in both the bankfull and floodprone zones. The plots in this sample were generally at to 2 feet above, and within 10 lateral feet of the normal high-water line. These are sites that probably receive frequent (seasonal to every few years) inundation by high-velocity flows which deposit coarse sediments and remove organic material from the surface. Often they are places where the stream is downcutting through coarse alluvial deposits, possibly from major events such as the floods of 1964 and the 1970's, forming new streambanks and terraces. The dominance of Sitka willow indicates the rooting zone remains moist during the growing season, but the ground surface







may be very dry and have a significant amount of exposed sand, gravel or cobbles. In this sample, the SASI2 PC occurred at low to mid elevations in narrow to wide alluviated valleys (Rosgen B and C channel types), at widespread locations on the western slope of the Cascades.

MANAGEMENT IMPLICATIONS -- The successional status of the SASI2 PC is uncertain, and may vary from site to site. It may represent the potential vegetation in sites that experience high, intense flows every few years. In less-frequently flooded sites, it may be successional to the ALRU, ALRU/ELGL or ALRU/STCO4 PC's.

Lacking a mature tree component, the SASI2 PC does not contribute large wood to the stream. Where it is adjacent to the stream edge, it can provide significant shade, especially in narrow channels. Sitka willow and red alder are also good stabilizers of the loose, coarse-textured substrates on these sites. Red alder also

enhances site productivity through nitrogen fixation.

These are sites that may, between high flows, experience low intensity inundation without significant disruption of the plant community. Being subject to rather frequent inundation, sites with the SASI2 PC are dynamic in terms of vegetative cover. Sitka willow and red alder are both good candidates for revegetation.

WILDLIFE HABITAT RELATIONSHIPS -- The shrub component in the SASI2 PC provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Where mature red alder is present, nesting and foraging habitat may be available for cavity nesters such as sapsuckers and downy woodpeckers. Red alder seeds are eaten by siskins and goldfinches. Spaces between cobble and gravel deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians.

Those sites with wide channels, gentle slopes, and at lower elevation provide wintering areas for deer and elk. These riparian areas also provide cool areas for relief from summer heat. Sitka willow and red alder provide high quality browse for deer and elk. The grass and forb understory provides some forage.

These sites contribute toward the capability of an area to support beaver. Sitka willow provides food and building material for dams. Red alder, where it occurs on site or in adjacent types, provides additional food and building material for dams. Willow and alder both resprout after cutting by beaver and thus are resilient in areas used by beaver. A beaver colony could be supported in the area only if the SASI2 PC and adjacent red alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The SASI2 PC commonly occurs adjacent to red alder-dominated types, especially Red Alder/Vinemaple (ALRU/ACCI), Red Alder/Blue Wildrye (ALRU/ELGL) and Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI), as well as the Sitka Willow/Coltsfoot (SASI2/PEFR2) community.

UPLAND -- In this sample, the SASI2 PC was found in conjunction with warm, moist Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) associations, primarily the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) and Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The SASI2 PC may be confused with the following types, and can be distinguished from them as noted below:

- ALRU/ELGL PC - dominated by red alder; Sitka willow not dominant
- ALRU (Shrub) PC - lacks Sitka willow
- SASI2/PEFR2 PC - coltsfoot is abundant; wetter surfaces
- HYPE PC - Common St. John's wort is abundant; Sitka willow minor

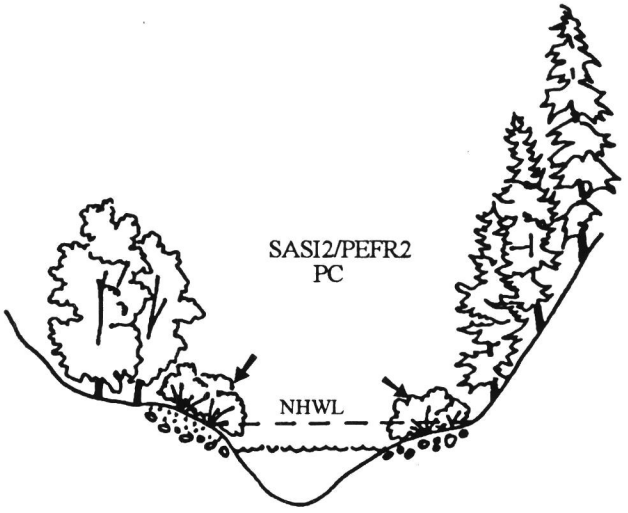
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The SASI2 PC has not been described elsewhere in this region.

SASI2/PEFR2 PLANT COMMUNITY **SW1132**

Salix sitchensis/Petasites frigidus

Sitka Willow/Coltsfoot

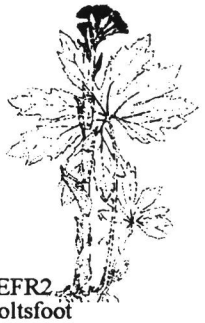
No. Plots = 10



SAS12
Sitka Willow

RUSP
Salmonberry

ALRU
Red Alder

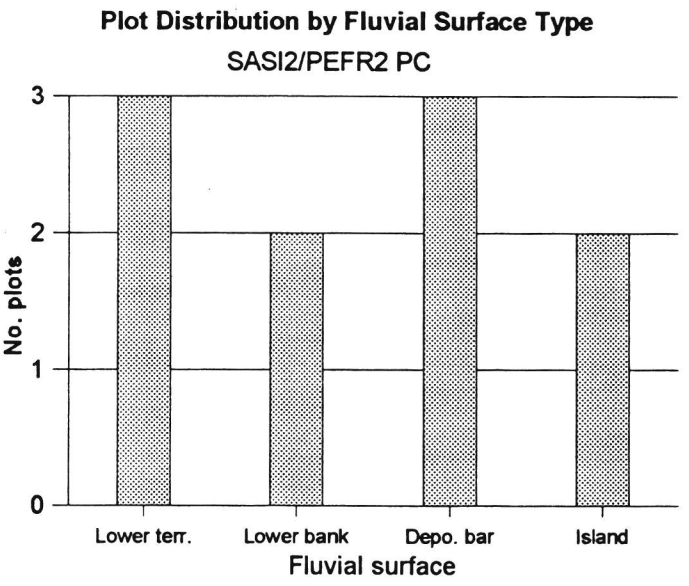

PEFR2
Coltsfoot

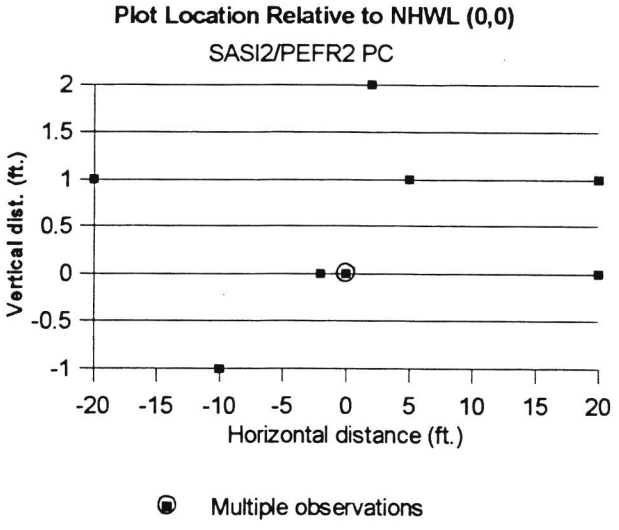
VEGETATION COMPOSITION AND STRUCTURE -- The SASI2/PEFR2 plant community (PC) is a moderate to densely shrubby community with a well-developed understory of forbs and grasses. Canopy height averaged 7 feet (range = 3 to 10 feet) in this sample. Moss cover is generally low if present at all. The shrub layer is dominated by Sitka willow (SASI2), frequently along with red alder (ALRU) and small amounts of salmonberry (RUSP). The understory consists of a generally dense cover of coltsfoot (PEFR2), commonly associated with Cooley's hedgenettle (STCO4), yellow monkeyflower (MIGU), common horsetail (EQAR) and various grasses. There was an average of 14.0 vascular plant species per plot in this sample of the SASI2/PEFR2 PC, with an average of 3.7 dominant species. These values are low compared to riparian types overall, reflecting the strong dominance of the community by Sitka willow and coltsfoot.

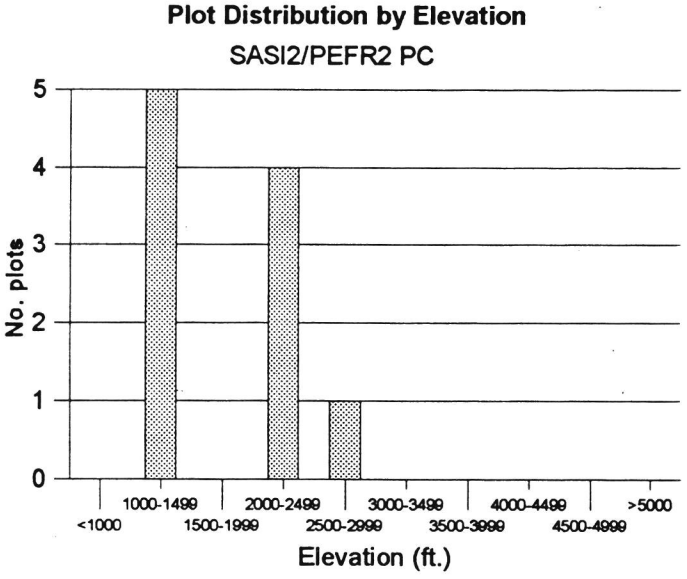
SPECIES	CODE	CONS.	%COV.
Shrubs			
Alnus rubra	ALRU	60	13
Rubus spectabilis	RUSP	50	3
Salix sitchensis	SASI2	100	35
Forbs			
Equisetum arvense	EQAR	70	2
Mimulus guttatus	MIGU	50	4
Petasites frigidus	PEFR2	100	23
Stachys cooleyae	STCO4	80	9
Grasses/grasslikes			
Unidentified grasses	GRAMI	50	2
Moss		40	9
Bare sand/soil		60	14
Gravel		60	18
Cobbles		70	39
Rock		30	13

ENVIRONMENT AND DISTRIBUTION -- The SASI2/PEFR2 PC occupies moist riparian sites that are probably frequently flooded, have a relatively long growing season and have coarse-textured substrates with a high water table. In this sample, it occurred on

gently-sloping alluvial streambanks, terraces, islands and depositional bars in both the floodprone and bankfull zones of narrow to wide, incised to somewhat alluviated valleys (Rosgen A channel types for the most part, occasionally type B or C). Plots were generally from 1 foot below to 2 feet above, and within 5 lateral feet of the normal high-water line. These are sites that probably receive frequent (seasonal to every few years) inundation by high-velocity flows which deposit coarse sediments and remove organic material from the surface. Substrates in this sample were generally either cobble-gravel mixtures, or a layer of sand a few cm. thick over cobbles, and organic material was limited. There was usually a significant amount of bare sand or rock. The species present indicate a high water table throughout the growing season, although the







ground surface may be quite dry. The SASI2/PEFR2 PC in this sample occurred at low to moderate elevations in widespread locations on the western slope of the Cascades.

MANAGEMENT IMPLICATIONS -- The successional status of the SASI2/PEFR2 PC is uncertain, and may vary from site to site. It may represent the potential vegetation in sites that experience high, intense flows every few years. In less-frequently flooded sites, it may be successional to the ALRU/PEFR2 PC.

Lacking a mature tree component, this community does not contribute large wood to the stream. Where it is adjacent to the stream edge, it can provide significant shade, especially in narrow channels. Sitka willow and red alder are good stabilizers of the loose, coarse-textured substrates on these sites. Red alder also enhances site productivity through nitrogen fixation.

These are sites that may, between high flows, experience low intensity inundation without significant disruption of the plant community. Being subject to rather frequent inundation, sites with the SASI2 PC are dynamic in terms of vegetative cover. Sitka willow and red alder are both good candidates for revegetation.

WILDLIFE HABITAT RELATIONSHIPS -- The shrub component in the SASI2/PEFR2 PC provides nest sites for birds and hiding and thermal cover for a variety of wildlife species. Salmonberry and red alder increase the diversity of wildlife habitat on many sites. Salmonberry provides berries for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Red alder seeds are eaten by siskins and goldfinches. Small mammals, rabbits, and porcupine consume the twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

Islands provide resting spots for waterfowl that offer some protection from mammalian predators. Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as shrews, garter snakes, and amphibians.

The gentle topography and lower elevation sites associated with the SASI2/PEFR2 PA provide wintering areas for deer and elk. These riparian areas also provide cool areas for relief from summer heat. Sitka willow and red alder provide high quality browse for deer and elk. The forb understory provides limited forage.

These sites contribute toward the capability of an area to support beaver. Sitka willow provides food and building material for dams. Red alder, where it occurs on site or in adjacent types provides additional food and building material for dams. Willow and alder both resprout after cutting by beaver and thus are resilient in areas used by beaver. A beaver colony could be supported in the area only if the SASI2/PEFR2 PA and adjacent red alder-dominated types are plentiful enough (approximately 1/2 mile of steam channel) to provide year-round food and dam building materials.

ASSOCIATED VEGETATION COMMUNITIES -- The SASI2/PEFR2 PC was most frequently found adjacent to red alder-dominated riparian types indicative of moist conditions, primarily the Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI) and Red Alder/Salmonberry/Oxalis (ALRU/RUSP/OXOR) communities. It also occurs in proximity to types dominated by salmonberry and stinkcurrant (RIBR), as well as the Sitka Willow (SASI2) community.

UPLAND -- In this sample, the SASI2/PEFR2 PC was found in conjunction with warm, moist Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) associations, primarily the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) and Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU) types.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The SASI2/PEFR2 PC may be confused with the following types, and can be distinguished from them as noted below:

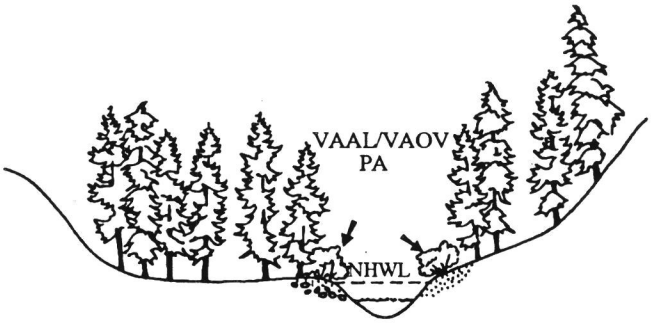
- ALRU/PEFR2 PC - red alder is dominant; Sitka willow not dominant
- RIBR-RUSP/PEFR2 - generally lacks Sitka willow; salmonberry and stinkcurrant are dominant
- SASI2 PC - coltsfoot not abundant; drier surfaces

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The SASI2/PEFR2 PC has not been described elsewhere in the Pacific Northwest.

VAAL-VAOV PLANT ASSOCIATION
Vaccinium alaskaense-V. ovalifolium
Alaska Huckleberry-Ovalleaf Huckleberry

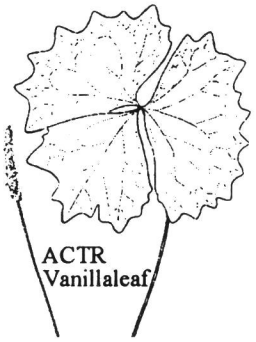
SW4132

No. Plots = 28



VAAL
Alaska Huckleberry

VAOV
Ovalleaf Huckleberry


ACTR
Vanillaleaf

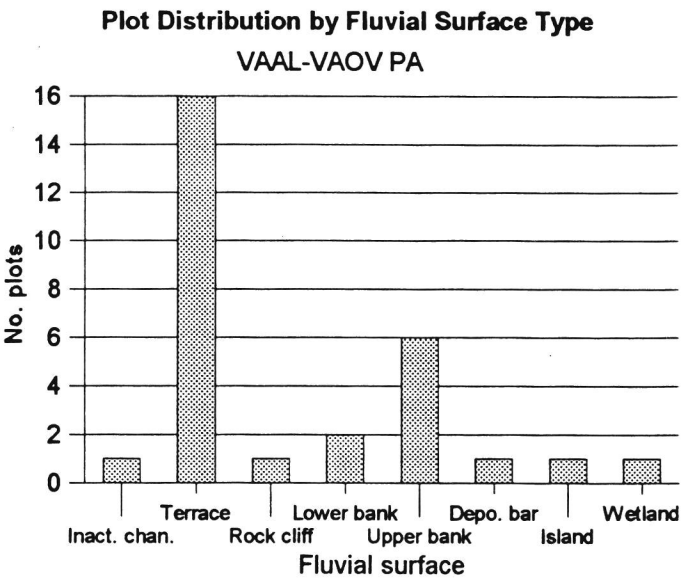
COCA
Bunchberry Dogwood

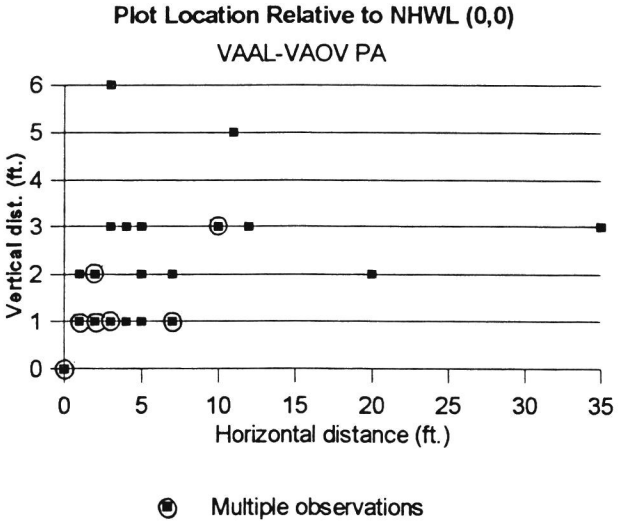
VEGETATION COMPOSITION AND STRUCTURE -- The VAAL-VAOV plant association (PA) consists of a moderate to dense layer of low shrubs (generally 3 to 6 ft. tall), with occasional taller shrubs or trees and a usually well-developed, diverse forb layer. Moss cover varies, but is generally moderate to high. The shrub layer is dominated by Alaska and/or ovalleaf huckleberry (VAAL, VAOV), sometimes with fool's huckleberry (MEFE), stinkcurrant (RIBR) or salmonberry (RUSP) in addition. In the forb layer, a number of species may be present in significant quantities; the most common are vanillaleaf (ACTR), bunchberry dogwood (COCA), coolwort foamflower (TITRU), claspleaf twistedstalk (STAM), arrowleaf groundsel (SETR) and mountain boykinia (BOMA). Scattered Pacific silver fir (ABAM) and western hemlock (TSHE) seedlings are common, but mature trees are usually absent. There was an average of 19.4 vascular plant species per plot in this sample of the VAAL-VAOV PA, with an average of 8.1 dominant species. These are relatively high values for riparian types overall.

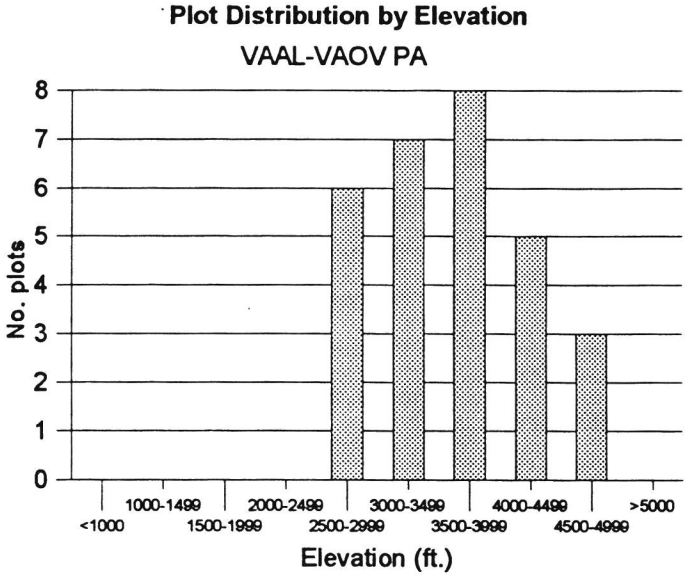
ENVIRONMENT AND DISTRIBUTION -- The

SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Abies amabilis	ABAM	54	5
Tsuga heterophylla	TSHE	57	3
Shrubs			
Menziesia ferruginea	MEFE	43	9
Ribes lacustre	RILA	43	5
Rubus spectabilis	RUSP	50	5
Vaccinium alaskaense	VAAL	43	28
Vaccinium membran.	VAME	36	5
Vaccinium ovalifolium	VAOV	54	20
Forbs			
Achlys triphylla	ACTR	75	6
Boykinia major	BOMA	43	6
Cornus canadensis	COCA	71	7
Senecio triangularis	SETR	50	2
Streptopus amplexifolius	STAM	46	4
Tiarella tri. var. unifol.	TITRU	57	5
Moss		55	31
Bare sand/soil		62	16
Gravel		10	13
Cobbles		14	15
Rock		24	29

VAAL-VAOV PA represents cool, moist riparian fringe sites with relatively productive, well-drained soils and a somewhat short and cool growing season. Inundation, if it occurs at all, is likely to be infrequent and low in intensity. One ecotype, the VAAL-VAOV Streambank/Terrace ET, is defined for this plant association. In this sample, it occurred mainly on flat to gently-sloping upper streambanks and terraces as a narrow fringe of vegetation adjacent to an upland conifer forest stand. All our plots were in the floodprone zone, usually between 1 and 3 feet above the normal high-water line and within 15 feet horizontal distance, in alluviated mountain valleys (Rosgen C channel type) or (less often) incised drainages (Rosgen B channel type). Even where the floodplain was wide (often 100 feet or more), the seasonally-flooded area was virtually







always narrow, usually 25 feet or less. These wide, stabilized floodplain terraces are often very productive and commonly develop a moist-site conifer forest that has an understory very similar to the VAAL-VAOV PA in composition. Soils in this sample were generally either deep alluvial sand/silt deposits, or sands and silts at least 15 cm. thick over cobbles or gravels. Many plots showed evidence of soil development and incorporation of organic material. The plots in this sample generally fell between 3000 and 5000 feet in elevation, and occurred throughout the study area on both sides of the Cascades crest. A similar community has been observed in the Cascades south of the study area in Oregon, but environmental and successional parallels to our type have not been established.

MANAGEMENT IMPLICATIONS -- The VAAL-VAOV PA probably represents the potential vegetation for sites where it occurs. It can be viewed as an extension of the understory of the adjacent upland conifer forest onto streamside landforms that are too moist, frosty, frequently inundated or prone to slumping

for tree seedlings to grow to maturity.

Lacking a conifer component, the VAAL-VAOV PA does not by itself provide a source of large wood to the stream, but the adjacent conifer stand is likely to. The low shrubs probably only provide shade for the periphery of the stream. The roots of huckleberries are rather shallow and dense, providing stability to the upper few inches of soil and helping prevent surface erosion.

These sites are likely to recover fairly quickly from disturbance (either from light flooding or ground disturbing activities); huckleberries are capable of rapid vegetative growth, can recolonize quickly in openings, and are adapted to cooler environments. In addition, many of the dominant forbs are rhizomatous and will spread readily to a suitable substrate.

WILDLIFE HABITAT RELATIONSHIPS -- The moderate to dense shrub layer in the VAAL-VAOV PA provides nest sites for birds and hiding cover for a variety of wildlife species. Huckleberries, salmonberry, stinkcurrant, and bunchberry dogwood provide berry crops for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, hares, and porcupine eat the twigs, bark and leaves of salmonberry and huckleberry. Salmonberry provides flower nectar for hummingbirds.

The flat to gentle topography and higher elevations associated with the VAAL-VAOV PA provide good summer range for deer and elk. Huckleberry, fool's huckleberry, and salmonberry provide quality browse for ungulates. The forb layer provides some additional forage. Theses sites are often next to cool, moist conifer stands that provide nearby thermal and hiding cover.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The VAAL-VAOV PA is usually found adjacent to other cool-moist site riparian types. The most common are the Sitka Alder (ALSI) and Yellow Monkeyflower (MIGU) types; in addition, the Arrowleaf Groundsel-Few-Flowered Aster (SETR-ASMO), Brook Saxifrage-Arrowleaf Groundsel (SAAR4-SETR) and Mountain Alder-Ovalleaf Huckleberry (ALIN-VAOV) types are often found near the VAAL-VAOV PA.

UPLAND -- Upland plant associations found in conjunction with the VAAL-VAOV PA are most commonly cool, moist Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) plant associations with a significant component of huckleberry species. The most prevalent are the Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA), Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL), Pacific Silver Fir/Big Huckleberry/Beargrass (ABAM/VAME/XETE) and Pacific Silver Fir/Rhododendron-Alaska Huckleberry/Bunchberry Dogwood (ABAM/RHMA-VAAL/COCA) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The VAAL-VAOV PA may be confused with the following types, and can be distinguished from them as noted below:

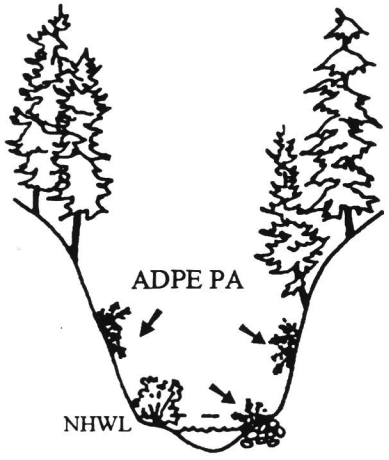
- ALIN-VAOV PA - mountain alder is dominant; herb layer is similar
- ALRU/TRCA3 PA - red alder is dominant; herb layer is similar but false bugbane is dominant
- ALSI PA - Sitka alder is dominant; herb layer is similar; occurs in wetter sites

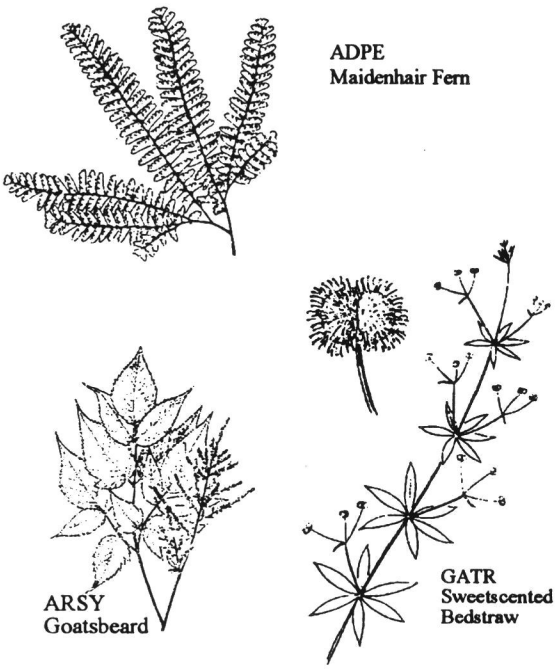
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The VAAL-VAOV PA has not been described elsewhere in the Pacific Northwest.

ADPE PLANT ASSOCIATION
Adiantum pedatum
Maidenhair Fern

FW4221

No. Plots = 22



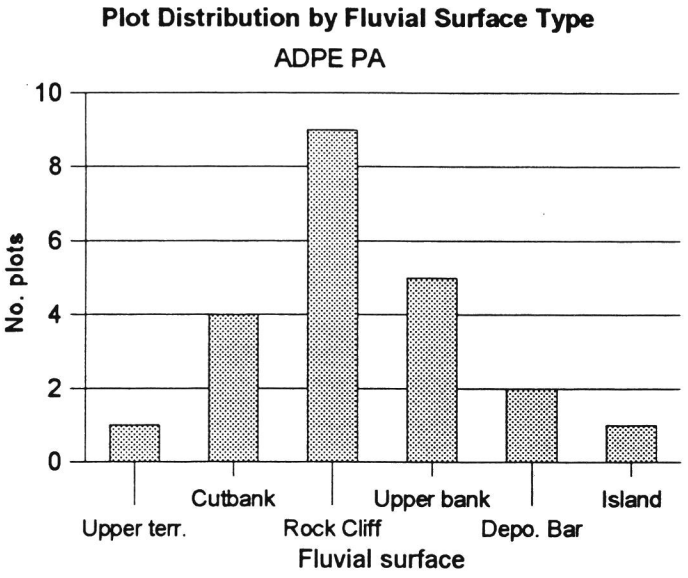


VEGETATION COMPOSITION AND STRUCTURE -- The ADPE plant association (PA) consists of a (usually) dense community of medium to tall forbs. Moss cover is usually well-developed. Maidenhair fern (ADPE) is always present at >=5% cover, and is often associated with goatsbeard (ARSY) and/or ladyfern (ATFI). Sweetscented bedstraw (GATR) is common, but low in abundance. Other moist-site herbs are frequently present. Small amounts of stinkcurrant (RIBR) often occur, and scattered mature and immature trees (western hemlock (TSHE), western redcedar (THPL) and red alder (ALRU)) may be found. There was an average of 14.9 vascular plant species per plot in this sampling of the ADPE association, with an average of 4.8 dominant species; this is slightly lower than average plant species diversity for riparian plant associations overall.

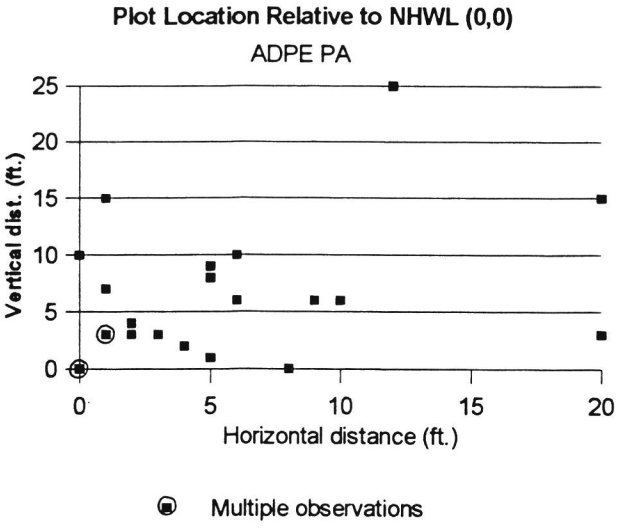
SPECIES	CODE	CONS.	%COV.
Shrubs			
Ribes bracteosum	RIBR	41	6
Forbs			
Adiantum pedatum	ADPE	95	15
Aruncus sylvester	ARSY	55	12
Athyrium filix-femina	ATFI	64	10
Galium triflorum	GATR	64	2
Lactuca muralis	LAMU	32	6
Montia sibirica	MOSI	36	2
Oxalis spp.	OXALI	32	6
Polystichum munitum	POMU	50	4
Streptopus amplexifolius	STAM	32	1
Tiarella tri. var. unifol.	TITRU	32	2
Moss		51	22
Bare soil/sand		45	13
Gravel		18	7
Cobbles		23	16
Rock		77	34

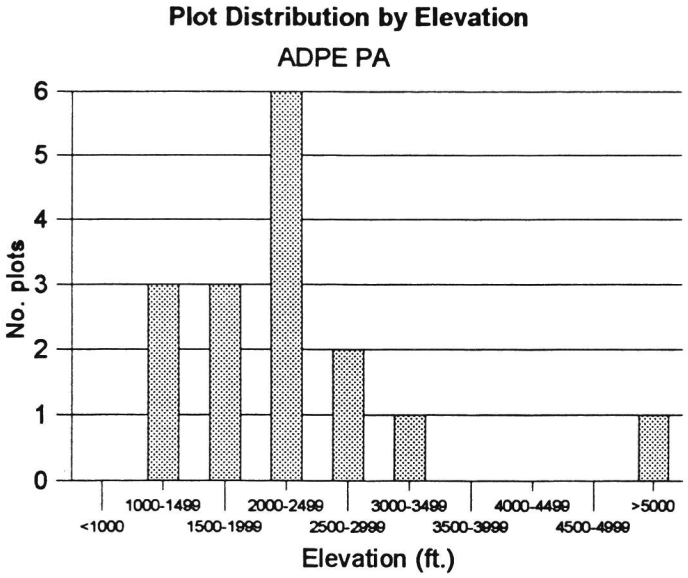
ENVIRONMENT AND DISTRIBUTION -- The ADPE PA occupies wet, shady environments with a rocky substrate and a moderate to long growing season, within the floodprone riparian zone. Water may be found at or very near the surface season-long,

either from seepage through fractured rock, splash and spray from flowing water, or a high water table. These sites are generally unfavorable for the development of woody vegetation, but support a rich community of moisture-loving forbs and mosses. Most of the plots in this sample occurred below 3000 feet elevation, although an isolated example was found above 5000 feet.



The ADPE PA occurs in two distinct ecotypes in this area. The most common is the ADPE Rocky Slope Ecotype (ET), which occurs on steep (often >80%) cliffs, outside bend cutbanks and streambanks above the bankfull zone, generally in high gradient, steep-sided narrow channels (Rosgen A and B channel types). Where this ecotype occurs the source of moisture is most likely to be seepage along rock fractures or





splash/spray from the adjacent stream, and the site is likely to be shaded both topographically and by surrounding forest vegetation. Humidity is high and contributes to moderation of temperature extremes. The rarer ADPE-Cobble Bar ET occupies older, gently-sloping fluvial cobble or gravel deposits (terraces, bars, islands) which have accumulated a small amount of sands and/or silts, and which have a high water table. These sites are probably not quite as cool and humid as those with the ADPE Rocky Slope ET, and have less likelihood of topographic shading. The ADPE-Cobble Bar ET occurs most commonly in alluviated mountain valleys with moderate to wide channels (Rosgen C channel type). Both ecotypes occur throughout lower elevation drainages on the west side of the Cascade Range in the Gifford Pinchot and Mt. Hood National Forests. The ADPE Rocky Slope ET has also been observed in upland situations, and is not restricted to the

riparian zone. The plant community similar to the ADPE PA has been observed farther south in the Cascades on the Willamette National Forest, but successional and environmental similarities to this type have not been established.

MANAGEMENT IMPLICATIONS -- The ADPE PA is linked to specialized habitats, and probably represents the potential natural vegetation of the sites in which it occurs. It does not typically develop significant tree or shrub cover, so is unlikely to contribute substantially to stream shading, slope stabilization or foliar input. It is mostly a community associated with microsites, so rarely occupies extensive contiguous areas within the riparian zone. However, even though minor in areal extent, its contribution to overall biological diversity is significant because of the habitat it offers to wildlife species of interest (see Wildife Habitat Relationships, below).

Slope stability may be a concern in some sites, particularly where the ADPE Rocky Slope ET occurs. Fractured bedrock or colluvium may be present, and where slopes are steep and saturated, ground disturbance may result in erosion or slope failure, with high sediment input to the adjacent stream. Stability is less of a concern where the type is situated on unfractured bedrock. Because the substrates are generally very wet and rocky where the ADPE PA occurs, revegetation following ground disturbance is likely to be difficult.

WILDLIFE HABITAT RELATIONSHIPS -- Sites occupied by the ADPE PA, particularly the ADPE Rocky Slope ET, provide unique habitat for several species of wildlife. Several species of amphibians are associated only with rocky, shaded streams. Cope's giant salamander (*Dicamptodon copei*) and tailed frog (*Ascaphus truei*) are found only in cold, rocky streams. Water seeping through rock fractures and the splash zone provide the unique microhabitat needs for Cascade torrent salamander (*Rhyacotriton cascadae*), Dunn's salamander (*Plethodon dunni*), and VanDyke's salamander (*P. vandykei*) (Gifford Pinchot only). The upland ADPE Rocky Slope ET provides habitat for the Larch Mountain salamander (*P. larselli*). All these salamanders are considered to be rare and are on one or more of the "sensitive" species lists maintained by the US Forest Service, Natural Heritage Program, or the States of Oregon and/or Washington.

The American dipper (*Cinclus mexicanus*) and harlequin duck (*Histrionicus histrionicus*) are strictly associated with rocky mountain streams. Both birds nest in rock crevices or cliffs adjacent to the stream. The harlequin duck is listed by US Fish and Wildlife Service as a Category 2 species. It is also considered Sensitive by the State of Oregon and is a Priority Species in the State of Washington.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The ADPE PA is commonly found with other riparian types that represent saturated soils and long growing seasons, and that are similar in plant species composition. The RIBR-RUSP/ATFI (Stinkcurrant-salmonberry/Ladyfern) and OPHO (Devilsclub) plant associations are particularly likely to co-occur with the ADPE type.

UPLAND -- The upland plant associations most commonly found near the ADPE sites are moist, herb-rich Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) associations that occur on toe slopes and terraces with deep, productive soils, abundant moisture and a long growing season: TSHE/POMU-OXOR (Western Hemlock/Swordfern-Oxalis), TSHE/POMU (Western Hemlock/Swordfern) and TSHE/OPHO/OXOR (Western Hemlock/Devilsclub/Oxalis).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The ADPE PA is relatively unique, and is not likely to

be confused with other riparian types described in this classification.

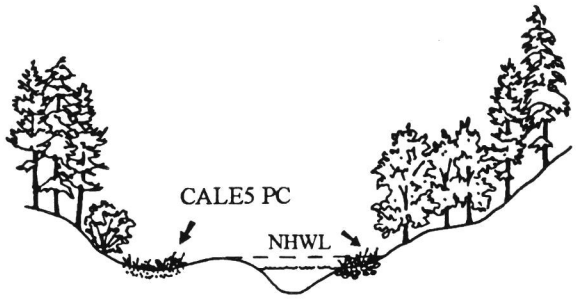
RELATIONSHIP TO OTHER CLASSIFICATIONS -- An ADPE PA has not been described elsewhere. Crowe and Clausnitzer (1996) have described an ADPE wetland plant community (not an association) in Eastern Oregon, but it differs significantly from our ADPE PA in floristic composition.

CALE5 PLANT COMMUNITY **MM2931**

Carex lenticularis

Lenticular Sedge

No. Plots = 3

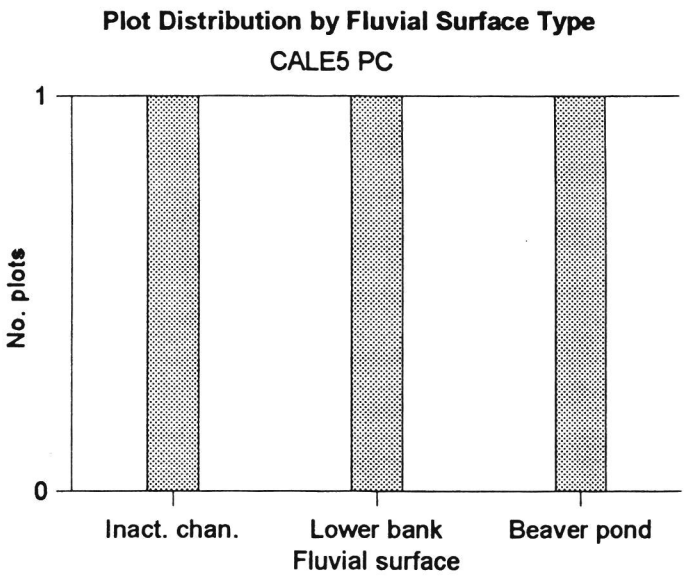


VEGETATION COMPOSITION AND STRUCTURE -- The CALE5 plant community (PC) is a dense single-layered sedge-grass community, often with scattered forbs and shrubs. Moss cover is absent or present in only trace amounts. Lenticular sedge (CALE5) is the dominant species, and often occurs with lesser amounts of small-flowered bulrush (SCMI) and/or tall mannagrass (GLEL). Traces of ladyfern (ATFI), common St. John's-wort (HYPE), streambank groundsel (SEPS), arrowleaf groundsel (SETR) and American vetch (VIAM) are often present. There is an average of 17 vascular plant species per plot in this sample, with an average of 4.4 dominant species. These values are both near the average values for riparian types in general.

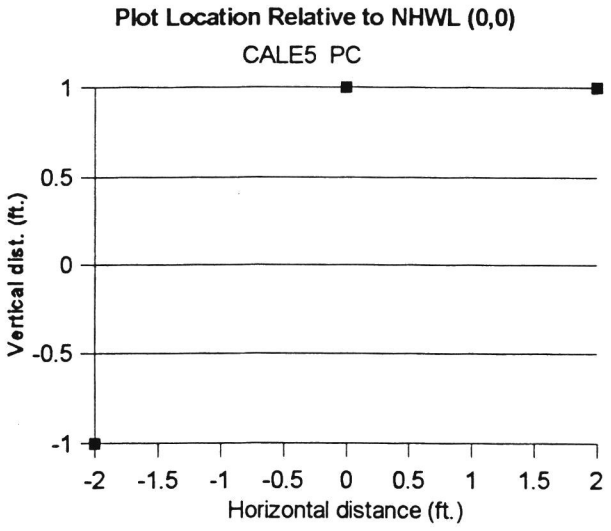
SPECIES	CODE	CONS.	%COV.
Forbs			
Athyrium filix-femina	ATFI	67	1
Hypericum perforatum	HYPE	67	1
Senecio pseudaureus	SEPS	67	1
Senecio triangularis	SETR	67	2
Veronica americana	VIAM	67	1
Grasses/grasslikes			
Carex lenticularis	CALE5	100	33
Glyceria elata	GLEL	67	6
Scirpus microcarpus	SCMI	67	4
Moss		33	1
Bare soil/sand		100	5
Gravel		67	10
Cobbles		33	15

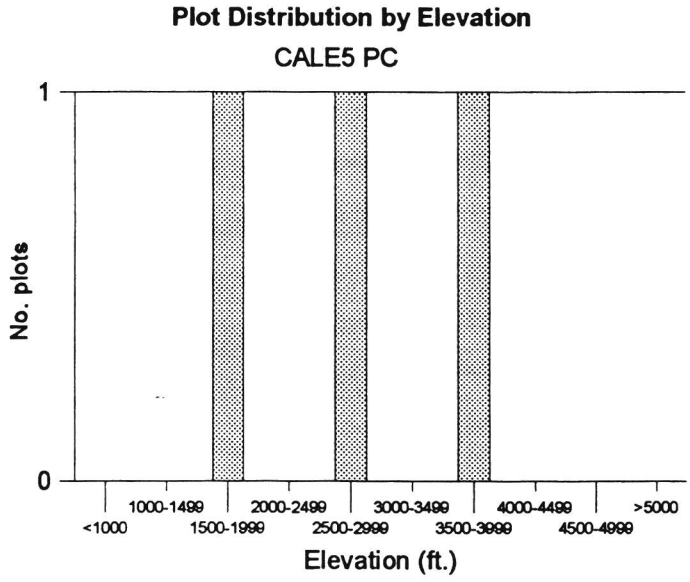
ENVIRONMENT AND DISTRIBUTION -- This plant community occurs in floodplain wetland sites, at a fairly wide range of elevations (1800-3600 feet in this sample). The few plots in this sample occurred on flat sites with a high water table (near the surface), and relatively fine-textured substrates (mucky silts to sand/gravel mixes). Although the sample of this type is very small, the data suggest that the CALE5 PC occurs in at least two distinct situations. Our plots fell: 1) in the floodprone zone of two floodplain wetland sites very close to the normal high-water line and 2) just within the bankfull zone on a

gravel bar. Substrates were mucks, silts and sands with considerable organic material incorporation. Both types of sites are likely to experience short return interval (seasonally to a few years apart), low intensity floods that may deposit small amounts of debris or fine alluvium, without disrupting the plant community. The CALE5 PC occurred in moderate gradient stream valleys that have a fairly wide active channel area and significant floodplain development (Rosgen B and C channel types), in three widely separated locations in the area, on both east and west slopes of the Cascade Range.



MANAGEMENT IMPLICATIONS -- The CALE5 PC probably represents the potential natural vegetation of sites where it occurs, as long as access to the water table is maintained. It is mostly a





community of microsites, and occurs in rather small patches in saturated floodplain sites as described above.

Because of excessive moisture it generally lacks the ability to produce trees and shrubs, and thus does not contribute significantly to stream shading or foliar input. The dense cover of grasses and grass-like plants is well-suited to trap fine sediments during periods of low intensity inundation, and is likely to play a developmental role in the succession of depositional surfaces. The dense fine roots also probably help stabilize and build up the ground surface. The risk of slope failure or erosion outside of extreme flood events is probably quite low. However, during extreme high water (10-year flood or greater), because of its proximity to the normal high water line, the CALE5 PC is likely to experience scour, deposition of cobbles or larger rock fragments, or loss of access to the water table; under these conditions the potential vegetation probably would be changed.

WILDLIFE HABITAT RELATIONSHIPS -- Wildlife habitat diversity for birds is limited in the CALE5 PC due to lack of a shrub component. Where the sites are adjacent to shrubby types, the edge between the shrub and sedge-grass type provides good habitat for wildlife that forage in the open but require shrub cover for nesting or resting.

In wetland sites, the CALE5 PC provides habitat for wetland-associated wildlife species like frogs, some salamanders, and ducks such as teal and mallard. The Cascades frog (*Rana cascadae*) and spotted frog (*R.. pretiosa*) may occur at higher elevation sites. The frogs are on one or more of the "sensitive" species lists maintained by U.S. Fish and Wildlife Service, Oregon Natural Heritage Program, or the States of Oregon and Washington.

The CALE5 PC provides small amounts of forage for deer and elk in winter and early spring. These areas provide thermal protection during hot periods and may get used as bedding and resting sites by deer and elk.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The CALE5 PC was most often found adjacent to the Arrowleaf Grounsel-Few-flowered Aster (SETR-ASMO), Red-Osier Dogwood (COST), Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV), Grand Fir-Western Redcedar/Skunkcabbage (ABGR-THPL/LYAM), Red Alder/Vinemaple (ALRU/ACCI) and Common St. John's Wort (HYPE) communities.

UPLAND -- The CALE5 PC in this sample occurred adjacent to moist, mesic Western Hemlock, Pacific Silver Fir and Grand Fir Zone upland plant associations: Western Hemlock/Alaska Huckleberry-Salal (TSHE/VAAL-GASH) and W. Hemlock/Alaska Huckleberry/Bunchberry Dogwood (TSHE/VAAL/COCA; Halverson and others, 1986); Pacific Silver Fir/Rhododendron-Dwarf Oregongrape (ABAM/RHMA-BENE; Hemstrom and others, 1982); and W. Redcedar-Grand Fir/Vanillaleaf (THPL-ABGR/ACTR) and W. Hemlock-Grand Fir/Queencup Beadlily (TSHE-ABGR/CLUN; Topik and others, 1988).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The CALE5 PC is relatively unique, and is not likely to be confused with other riparian types described in this classification.

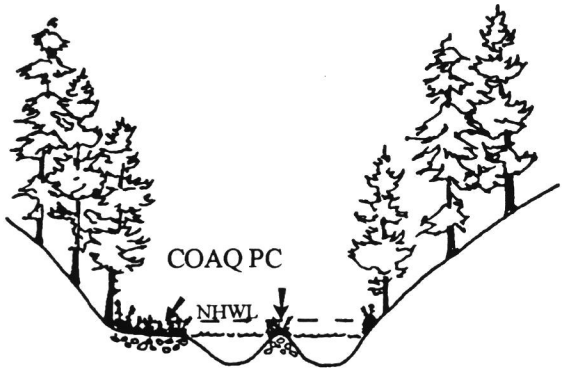
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The CALE5 community has not been described elsewhere in the Pacific Northwest.

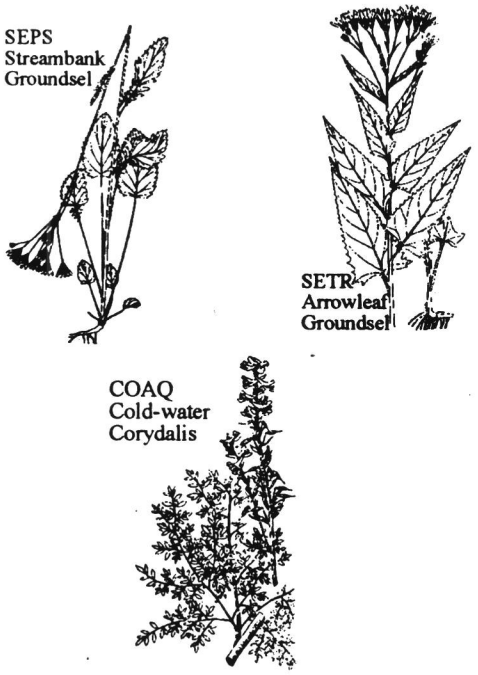
COAQ PLANT COMMUNITY **FW4321**

Corydalis aquae-gelidae

Cold-water Corydalis

No. Plots = 3



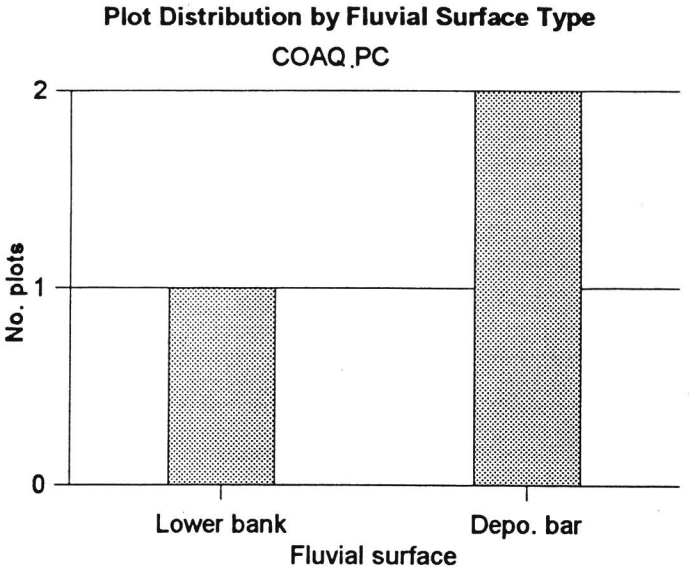


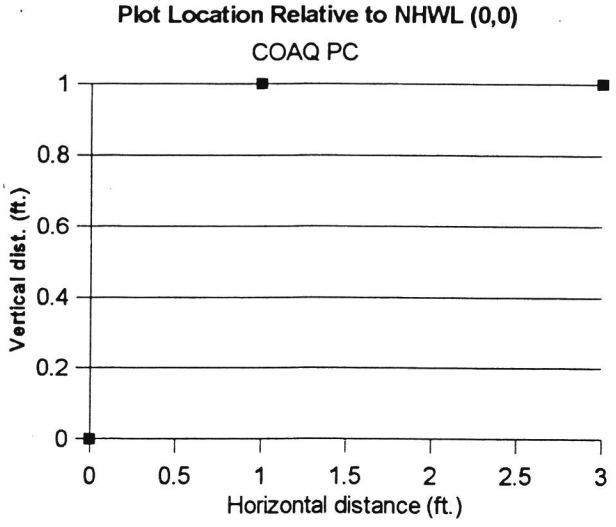
VEGETATION COMPOSITION AND STRUCTURE -- The COAQ Plant Community (PC) is a dense low forb community that occurs in patches generally less than 10 feet wide and 25 feet long, parallel to the stream. Moss cover is variable. Cold-water corydalis (COAQ) is the dominant plant and averaged 67% foliar cover in this sample. Small amounts of streambank groundsel (SEPS) and arrowleaf groundsel (SETR) are common, and traces of monkshood (ACCO), few-flowered aster (ASMO) and poison larkspur (DETR) often occur. Traces of mountain alder (ALIN) and ninebark (PHCA3) may also be present. There was an average of 10.7 vascular plant species per plot in this sample, with an average of 1.6 dominant species. These values are the lowest diversity statistics recorded for riparian plant communities in our area, and reflect the strong dominance of cold-water corydalis in these sites.

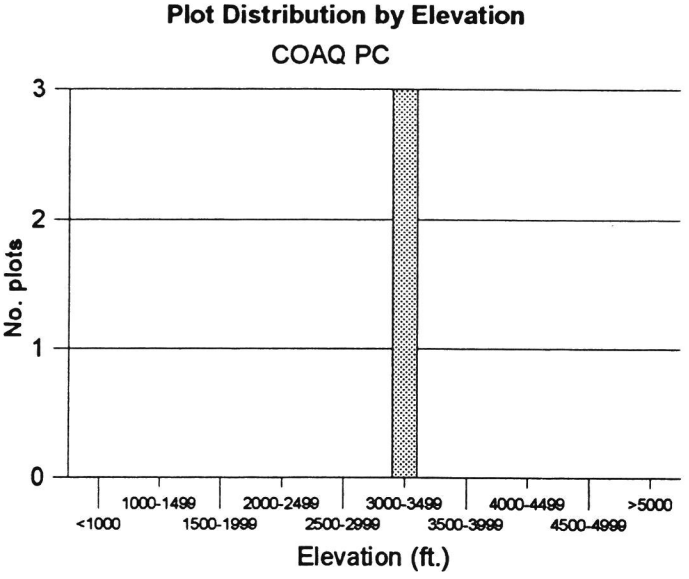
SPECIES	CODE	CONS.	%COV.
Forbs			
Aconitum columbianum	ACCO	67	1
Aster modestus	ASMO	67	1
Corydalis aquae-gelidae	COAQ	100	67
Delphinium trolliifolium	DETR	67	1
Senecio pseudaureus	SEPS	67	5
Senecio triangularis	SETR	67	2
Moss	MOSS	100	22
Bare soil/sand		33	1
Gravel		100	35
Cobbles		100	31
Rock		33	5

ENVIRONMENT AND DISTRIBUTION -- The COAQ PC occupies cool, wet, shady environments, and is restricted to sites of sand/gravel deposition very close to the normal high waterline, where the substrate is often saturated by flowing water for a considerable portion of the growing season. As the name implies, cold

water is a key feature of the habitat for the COAQ PC; Goldenberg (1992) found an average stream temperature during the growing season of 9.6° C. (49° F.) in COAQ sites on the Mt. Hood National Forest. The COAQ PC has a rather limited distribution at mid to upper elevations, mostly within the Oak Grove Fork and upper Clackamas River drainages and in the western portion of the Wind River Ranger District (Stein, 1995). It may also be found in other drainages in the western portion of the Mt. Hood National Forest. It occurs primarily in moderate to steep-gradient valleys with some floodplain development (Rosgen B and C channel types), but low seasonal fluctuation in flow (Goldenberg, 1992). The few plots in this







sample of the COAQ PC were all from Stone Creek on the Mt. Hood National Forest (Bear Springs Ranger District), on gravel deposits (lower bank, bars) above the bankfull zone but within 1 vertical foot of the normal high-water line, between 3000 and 3500 feet elevation (it has been observed outside this elevation range, however). The COAQ PC has also been observed within the bankfull zone in other sites.

MANAGEMENT IMPLICATIONS -- Cold-water corydalis is listed as a "Survey and Manage" species by the Record of Decision for the Northwest Forest Plan and as a Sensitive Plant Species in both Oregon and Washington States; thus sites with this plant community require special attention. Where the COAQ PC occurs, cold-water corydalis has become well-established and probably constitutes the potential natural vegetation given the hydrologic regime. Not every site with cold-water corydalis keys to a COAQ PC (it

must be the dominant species), but when it does, the site should be considered an important element in the conservation of the species as a whole. The Draft Management Recommendations for *Corydalis aquae-gelidae* (Stein, 1995) advises prohibition of site-disturbing activities, maintenance of hydrologic conditions (saturated sands/gravels for the majority of the growing season) and establishment of protective buffers where this type occurs. In addition, canopy cover and cold water temperatures should be maintained. Thinning may enhance corydalis sites that have developed a excessive cover of red alder following logging or road building.

Because of the structure of its vegetation, the COAQ PC does not contribute significantly to the potential for large wood in the stream, to foliar input, shading or slope stabilization (although the adjacent coniferous forest would). For additional information on the autecology and management considerations of cold-water corydalis, consult Goldenberg (1992) and Stein (1995).

WILDLIFE HABITAT RELATIONSHIPS -- Use of the COAQ PC by wildlife is limited due to the lack of structural diversity. Traces of mountain alder and ninebark, and overhanging coniferous cover from adjacent types, provide the only structure for songbirds. The dense forb cover provides a limited amount of cover for amphibians and small mammals. Little to no forage occurs. Any grazing occurs opportunistically as animals pass through the habitat.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In this sample of the COAQ PC, the SETR-ASMO (Arrowleaf Groundsel-Few-flowered Aster), MIGU (Yellow Monkeyflower), SAAR4-SETR (Brook Saxifrage-Arrowleaf Groundsel) and ALIN-VAOV (Mountain Alder-Ovalleaf Huckleberry) plant associations are the most common associated riparian types. All of these communities represent wet, shady floodplain or streambank sites with a significant amount of overhanging coniferous canopy cover.

UPLAND -- Mesic Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) and upper slope Western Hemlock Zone Plant Associations (Halverson and others, 1986; Topik and others, 1986) were most commonly found adjacent to the COAQ PC. The most prevalent were the Pacific Silver Fir/Big Huckleberry/Queencup beadlily (ABAM/VAME/CLUN), Western Hemlock/Dwarf Oregongrape (TSHE/BENE), Western Hemlock/Vine maple/Vanillaleaf (TSHE/ACCI/ACTR) and Western Hemlock/Rhododendron/Beargrass (TSHE/RHMA/XETE) plant associations.

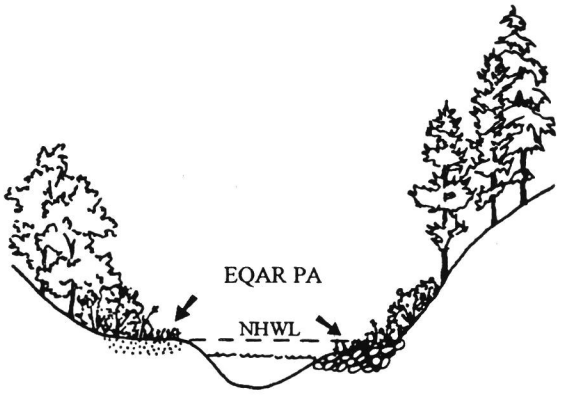
SIMILAR TYPES IN THIS AREA -- The COAQ PC is relatively unique, and is not likely to be confused with other riparian types described in this classification.

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The COAQ PC has not been described elsewhere in the Pacific Northwest.

EQAR PLANT ASSOCIATION **FW4222**

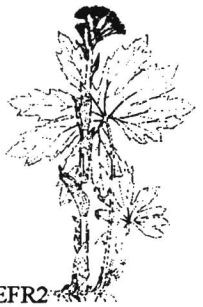
Equisetum arvense
Common Horsetail

No. Plots = 10



EQAR
Common Horsetail

STCO4
Cooley's Hedgenettle


PEFR2
Coltsfoot

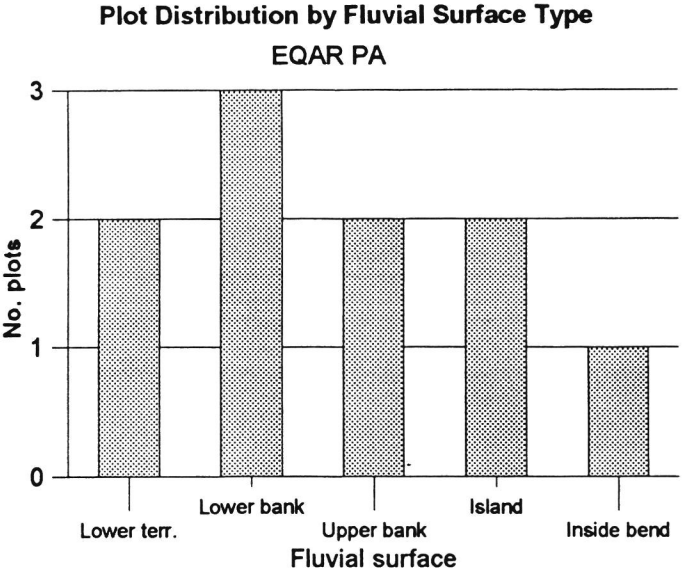
VEGETATION COMPOSITION AND STRUCTURE -- The EQAR plant association (PA) is a moderately dense to dense community of low forbs and grasses, often with scattered shrubs. Moss cover is usually sparse, rarely reaching 50% cover in this sample. The dominant plant species is common horsetail (EQAR), often associated with coltsfoot (PEFR2) and Cooley's hedgenettle (STCO4). Small amounts of smooth willow-weed (EPGL), tall mannagrass (GLEL), orchardgrass (DAGL, a non-native species), woodreed (CILA2) and angelica (ANAR2) may be present. Shrub-form red alder (ALRU) is common but low in abundance. There was an average of 17.2 vascular plant species per plot in this sample, with an average of 4.0 dominant species. These are average values compared to other riparian vegetation types.

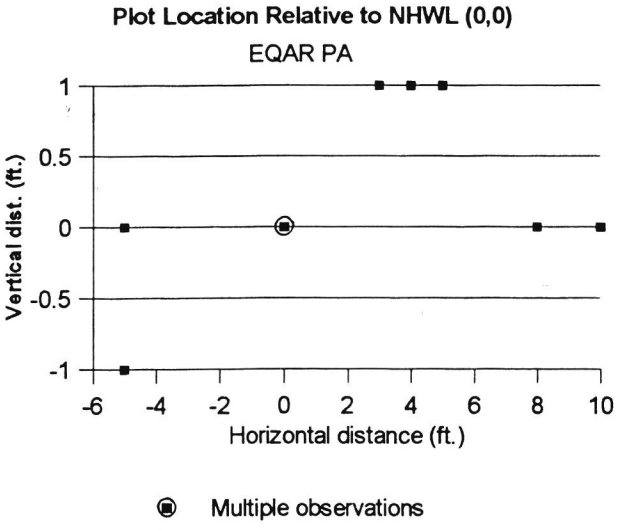
SPECIES	CODE	CONS.	%COV.
Shrubs			
Alnus rubra	ALRU	70	5
Forbs			
Angelica arguta	ANAR2	40	2
Epilobium glaberrimum	EPGL	40	5
Equisetum arvense	EQAR	100	37
Petasites frigidus	PEFR2	70	11
Stachys cooleyae	STCO4	80	7
Grasses/grasslikes			
Cinna latifolia	CILA2	40	2
Dactylis glomerata	DAGL	40	3
Glyceria elata	GLEL	40	5
Moss		50	19
Bare soil/sand		80	16
Gravel		40	14
Cobbles		80	16
Rock		40	9

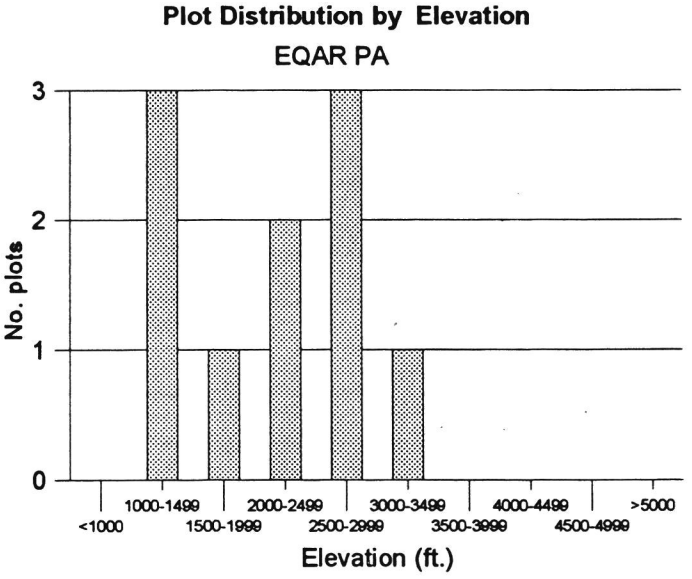
ENVIRONMENT AND DISTRIBUTION -- The EQAR PA, in this sample, occurred at low to mid elevations (mostly below 2500 feet elevation) on both sides of the Cascade crest. A similar community has been observed in the Coast Range of Oregon, but environmental and successional parallels to the

EQAR PA have not been established. In this sample, the EQAR PA was found on recent, flat to gently sloping sand, gravel and cobble deposits 1 foot below to 1 foot above the normal high-water line in steep-gradient incised to somewhat alluviated mountain valleys (usually Rosgen channel type A). The substrates were coarse and characterized by a droughty surface, but the species present indicate abundant moisture in the rooting zone. The EQAR PA represents cool, moist environments with a relatively long growing season, recent fluvial deposition, and frequent inundation.

Two ecotypes with the EQAR PA are described from this sample. The EQAR Alluvial Sand-Gravel ET was found slightly above the bankfull zone (roughly 1 foot above and 3 to 8 feet horizontal distance from the normal high water line in this sample), and reflects a less frequent (probably every few years),







lower intensity flooding regime. In this sample, it occurred on terraces, upper streambanks and depositional inside bends. The substrate consisted of several centimeters of sand over gravels and cobbles. The EQAR Alluvial Cobble ET occurred within the bankfull zone, mostly on lower streambanks and islands, and had substrated consisting of cobbles with small amounts of gravel or sand. Surface cobble cover averaged 30%. These sites are seasonally flooded, with stream velocity high enough to preclude substantial deposition of finer sands and accumulation of organic matter. Coltsfoot is more abundant in the EQAR Cobble ET.

MANAGEMENT IMPLICATIONS -- The EQAR PA probably represents the potential vegetation in sites where it is found, as a result of frequent inundation and alluvial deposition. In a sense these are sites that are

perpetually in a state of early succession; the plant community has few seasons to develop between disturbances. Common horsetail is a characteristic species of recently disturbed sites in a wide range of environments, and is often considered "weedy". The stems are annual, but the plants are perennial, reproducing prolifically by rhizomes in suitable substrates.

The EQAR PA affords a minor amount of shade and foliar input to streams, and does little to enhance slope stability or contribute to organic matter accumulation on floodplain landforms. During low intensity flooding it may help decrease stream velocity and contribute to deposition of plant propagules and finer gravels and sands.

Vegetation establishment faces challenges presented by the frequency of flooding, and because of the dry and coarse-textured substrate. Common horsetail, as a characteristic pioneer species, is likely to recover from a disturbance as long as rhizomes or spores are present. Red alder is a good candidate for revegetation if additional shade or substrate stabilization are desired; it would have the greatest likelihood of success on the finer substrates and less-often flooded surfaces of the EQAR/Sand-gravel ET, outside the bankfull zone.

WILDLIFE HABITAT RELATIONSHIPS -- The EQAR PA has little structural diversity and thus has limited value as wildlife habitat. Some cover and foraging habitat is available for song birds where red alder occurs. The red alder also provides browse for deer and elk. Small amounts of grass and forbs may be grazed opportunistically as animals pass through the habitat.

Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians. Use of this food source increases where adjacent habitats provide cover of vegetation, boulders, or down wood. These sites occasionally occur on islands that provide resting spots for waterfowl that offer some protection from mammalian predators.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The EQAR PA occurred with a wide variety of riparian types in this sample. The most common were Red Alder/Thimbleberry (ALRU/RUPA), Red Alder/Piggyback Plant-Siberian Miner's Lettuce (ALRU/TOME-MOSI), Coltsfoot (PEFR2), Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) and Cooley's Hedgenettle-Yellow Monkeyflower (STCO4-MIGU).

UPLAND -- A wide range of upland plant associations occurred adjacent to the EQAR PA. In this sample the Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE; Hemstrom and others, 1982; Brockway and others, 1983) and Western Hemlock/Swordfern (TSHE/POMU; Topik and others, 1986; Halverson and others, 1986) types were most common, but several other mesic Western Hemlock, Pacific Silver Fir and Grand Fir Zone (Topik and others, 1988 and 1989) types were found as well.

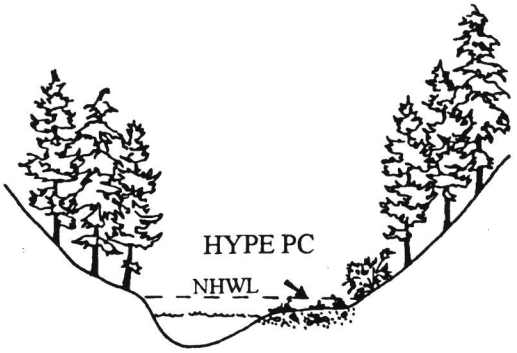
SIMILAR RIPARIAN TYPES IN THIS AREA -- The EQAR PA may be confused with the following types, and can be distinguished from them as noted below:

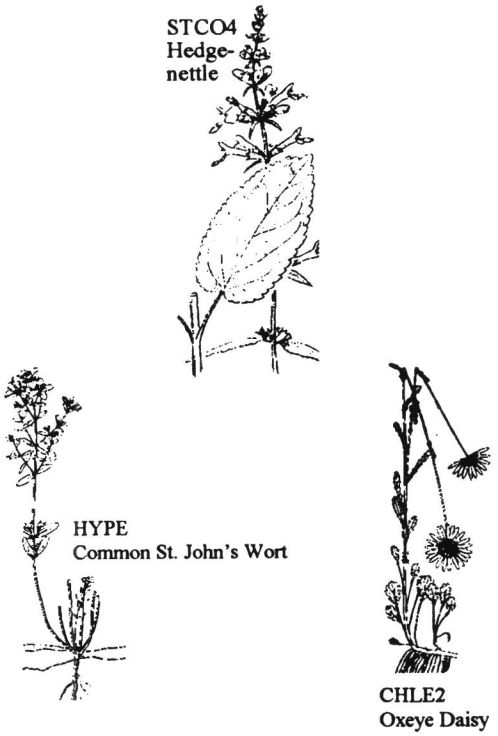
- ALRU/PEFR2 PC - dominated by red alder; common horsetail is not a dominant species
- PEFR2 PC - generally lacks common horsetail; dominated by coltsfoot
- SCMI PC - small-fruited bulrush is dominant
- STCO4-MIGU PA - Cooley's hedgenettle and yellow monkeyflower are dominant

RELATIONSHIP TO OTHER CLASSIFICATIONS -- An EQAR PA is described by Crowe and

Clausnitzer (1996) in forests of eastern Oregon, on very similar substrates and fluvial surfaces. Although these two versions are floristically very comparable, the eastern Oregon type occurs at much higher elevations (well over 4000 feet) and there are significant differences in associated species.

HYPE PLANT COMMUNITY
Hypericum perforatum
Common St. John's Wort



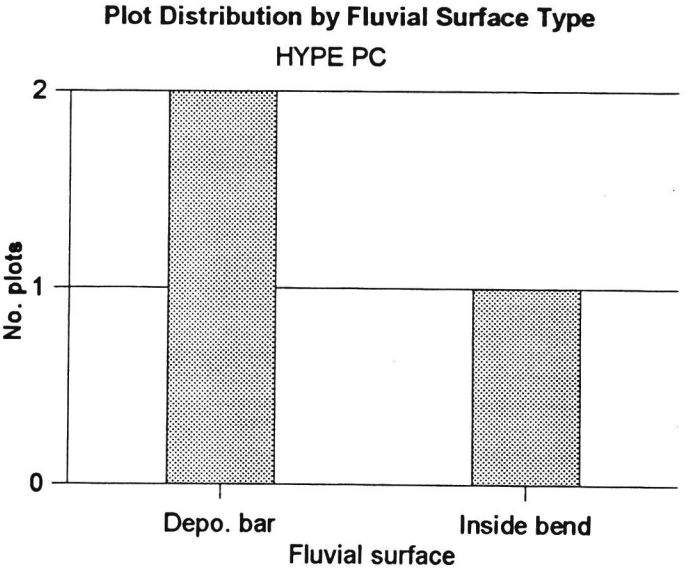


VEGETATION COMPOSITION AND STRUCTURE -- The HYPE plant community (PC) is a sparse, depauperate community of forbs and grasses, many of which are non-natives. Scattered shrubs may be present. The dominant plant species is common St. John's wort (HYPE), associated with oxeye daisy (CHLE2). Cooley's hedgenettle (STCO4), blue wildrye (ELGL), tansy ragwort (SEJA), thistle (CIRSI), common horsetail (EQAR), common chickweed (CEVU) and curly dock (RUCR) are usually present, in very small amounts. Scattered Sitka willow (SASI2) often occurs. Total vegetation cover was always less than 20% in this sample of the HYPE PC, and moss was absent. There was an average of 13.3 vascular plant species per plot, a somewhat low value compared to other riparian vegetation types.

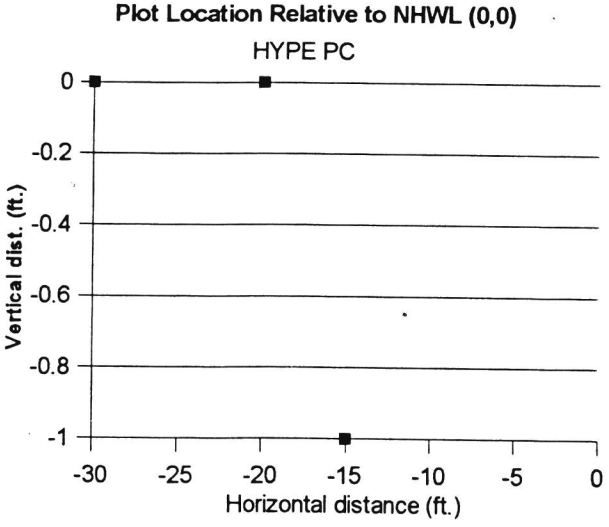
SPECIES	CODE	CONS.	%COV.
Shrubs			
Salix sitchensis	SASI2	67	3
Forbs			
Cerastium vulgatum	CEVU	67	1
Chrysanth. leucanthemum	CHLE2	100	2
Cirsium spp.	CIRSI	67	4
Equisetum arvense	EQAR	67	2
Hypericum perforatum	HYPE	100	5
Rumex crispus	RUCR	67	1
Senecio jacobaea	SEJA	67	2
Stachys cooleyae	STCO4	67	4
Grasses/grasslikes			
Elymus glaucus	ELGL	67	6
Moss		0	0
Bare soil/sand		67	3
Gravel		100	48
Cobbles		100	30

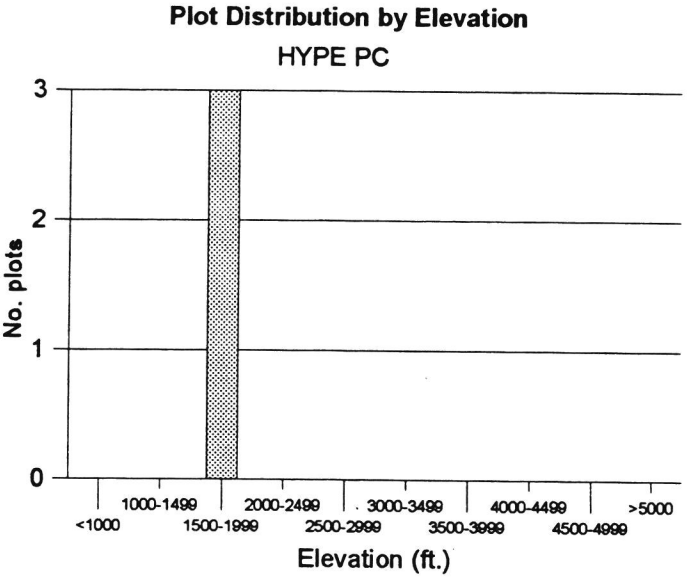
ENVIRONMENT AND DISTRIBUTION -- The HYPE PC occurs on very recent coarse-textured fluvial deposits (mostly mixtures of sand, gravel and cobbles) well within the bankfull zone. It indicates sites of low effective moisture during the growing season that are probably reworked by fluvial action on an annual basis. The plots in this sample were all

from one area, but this plant community has been observed to occur widely throughout the area on the west side of the Cascades crest, at moderate to low elevations. It also occurs outside the riparian zone in sites that have been surfaced with gravel, for example the margins of parking lots and road shoulders. The presence of non-native species in the riparian zone is generally related to human disturbance (usually road building) upstream or upslope. The plots in this sample either had clearcuts adjacent to the riparian zone or were below road crossings.



MANAGEMENT IMPLICATIONS -- Because the vegetation cover is so sparse, the HYPE PC does not contribute significantly to shading, foliar input to the stream or slope stabilization. It does provide a source of non-native seed that may spread downstream to other sites of fluvial disturbance. Tansy ragwort and common St. John's wort are listed as noxious weeds for this area.





The dominance of "weedy" non-native species (St. John's wort, ox-eye daisy, tansy ragwort, thistle, common chickweed and curly dock) in a relatively non-competitive environment suggests that few of our native species are adapted to the droughty growing season conditions and frequent disturbances characteristic of these sites, and that without the "weeds" these would be mostly non-vegetated fluvial landforms. Because the non-natives are prolific pioneer species, they are likely to spread into nearby disturbed areas, where they may successfully compete with native plant species under more favorable environmental conditions.

WILDLIFE HABITAT RELATIONSHIPS -- The HYPE PC has limited use by wildlife due to lack of structural diversity. Where scattered willow occurs there would be some use by birds. Spaces between cobble

and gravel deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians. At some sites small amounts of preferred forage species occur and are probably grazed opportunistically as animals pass through the habitat.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- In this sample, the HYPE PC was found adjacent to the Red Alder/Vinemaple (ALRU/ACCI) plant community most frequently, followed by the Red-osier Dogwood (COST) and Lenticular Sedge (CALE5) types. However, because of its widespread distribution, it is likely to occur with many other riparian vegetation types as well.

UPLAND -- The Pacific Silver Fir/Coolwort Foamflower (ABAM/TIUN; Brockway and others, 1983) and Western Hemlock/Coolwort Foamflower (TSHE/TIUN; Topik and others, 1986) plant associations were found adjacent to the HYPE PC in this sample. These types indicate cool, moist, productive forest conditions.

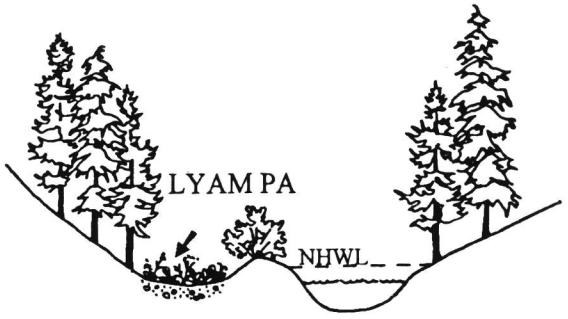
SIMILAR RIPARIAN TYPES IN THIS AREA -- The HYPE PC may be confused with the SASI2 PC, and can be distinguished from it by the fact that the SASI2 PC has Sitka willow as a dominant species.

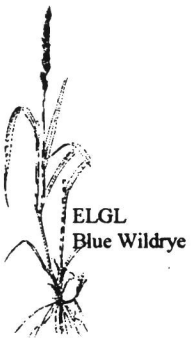
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The HYPE PC has not been described elsewhere in the Pacific Northwest.

LYAM PLANT ASSOCIATION
Lysichitum americanum
Skunkcabbage

No. Plots = 10

FW4223

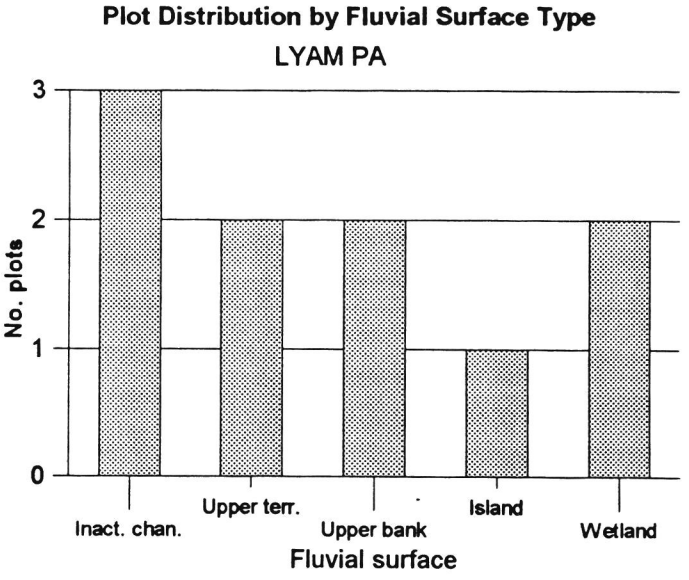


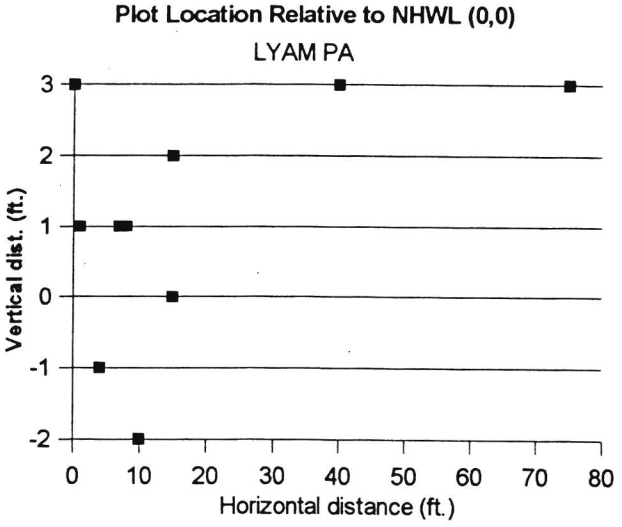


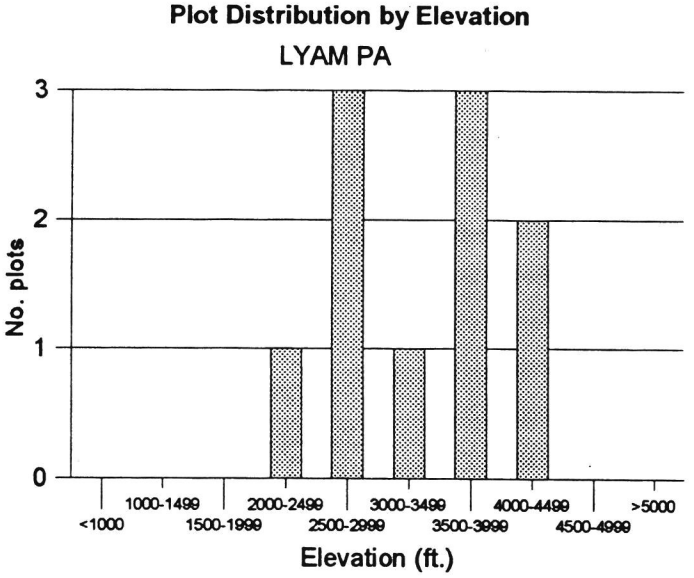
VEGETATION COMPOSITION AND STRUCTURE -- The LYAM plant association (PA) is a moderately dense to dense community dominated by medium to tall forbs. Scattered shrubs and conifer seedlings are common. Moss cover varies; in this sample it ranged between 10% and 60% cover. Skunkcabbage (LYAM) is the dominant species, and is frequently associated with arrowleaf groundsel (SETR), ladyfern (ATFI), coolwort foamflower (TITRU), and tall mannagrass (GLEL). Small amounts of smooth willow-weed (EPGL2), claspleaf twistedstalk (STAM) and smooth-stemmed sedge (CALA) may be present. About half the plots in this sample had scattered salmonberry (RUSP) and/or western redcedar (THPL) seedlings as well. An average of 17.4 vascular plant species per plot were recorded in this sample, with an average of 7.9 dominant plants. This reflects average species richness compared to riparian types overall, but higher than average dominance, indicating that there are several species with high foliar cover (rather than just a few dominants).

SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Thuja plicata	THPL	50	5
Shrubs			
Rubus spectabilis	RUSP	50	3
Forbs			
Athyrium filix-femina	ATFI	50	12
Epilobium glaberrimum	EPGL2	40	4
Lysichitum americanum	LYAM	100	17
Senecio triangularis	SETR	70	4
Streptopus amplexifolius	STAM	40	2
Tiarella tri. var. unifol.	TITRU	50	4
Grasses/grasslikes			
Carex laeviculmis	CALA	40	8
Glyceria elata	GLEL	50	4
Moss		60	31
Bare soil/sand		90	17
Cobbles		10	5
Rock		40	5

ENVIRONMENT AND DISTRIBUTION -- The LYAM PA is a widespread wetland vegetation type found both in and outside of riparian sites. It indicates year-round saturated soil conditions and high substrate organic matter content, and occurs at low to high elevations on both sides of the Cascade crest (the plots in this sample occurred mostly between 2500 and 4000 feet in elevation). It is frequently found as small patches (less than 1 acre) of marsh within a matrix of forested swamp or upland vegetation. Areas of perched water table, seeps and springs are common sites for the LYAM PA. Even though soils are generally high in organic matter where the LYAM PA is found, in this sample they did not have the peat accumulations characteristic of true fens and bogs.







Two ecotypes with the LYAM PA were identified in this sample. The LYAM Palustrine Marsh ET is not restricted to the riparian zone, and in this sample occurred adjacent to small (bankfull width = 10 ft.) headwater reaches of streams flowing through broad (glaciated?) valleys that have a high water table near the stream. The stream is basically confined to the channel in these sites, and although the adjacent valley floor is rather flat, it is not the floodplain of the current stream. In this ecotype, the LYAM PA occured on "seepy" flat streambanks, and the substrate was generally composed of mucks and silts, lacking a gravel component. The LYAM Riverine Marsh ET occurred on flat to gently sloping fluvial landforms in valleys that have developed floodplain features - Rosgen B and C channel types. It is found in the floodprone zone, on terraces, flat upper streambanks, and low islands in braided channels. The substrate in this ecotype consisted of a combination of silts, sands and/or mucks over gravel. The hydrologic regime is typically one of low intensity flooding, possibly every few years to decades, that deposits fine materials and organic debris and

leaves the plant community relatively intact.

MANAGEMENT IMPLICATIONS -- The LYAM PA probably represents the potential vegetation community for the sites on which it occurs, as long as the saturated soil conditions are maintained.

Since the high water table discourages the development of forest cover, this type does not contribute significantly to large woody debris input, shading or slope stability of riparian sites. It does provide a source of herbaceous foliar input to the stream, and during periods of inundation helps trap fine sediments and organic material.

Both ecotypes (and wetlands adjacent to streams in general) serve as a hydrologic buffer for water moving from the upland into the stream, contributing significantly to water quality. This function can be severely impaired by ground disturbance. For this reason, and because the sites are likely to be difficult to revegetate due to excessive soil moisture, ground disturbance should be avoided where the LYAM PA is found. Likely consequences of soil disturbance include loss of soil structure, channelized flow, and increased erosion. Although wetland soils are often very productive when drained, gains in biomass production would likely be offset by losses in biological diversity and hydrologic function.

WILDLIFE HABITAT RELATIONSHIPS -- The LYAM PA often occurs as a small gap in a forested matrix that provides structural diversity at the stand scale. Small gaps are associated with increases in diversity of wildlife species. Scattered salmonberry and western redcedar seedlings provide some cover and foraging habitat for song birds. Salmonberry produces berries for small birds, grouse, quail, band-tailed pigeon, small mammals, bear, fox and coyote. Small mammals, rabbits, and porcupine eat twigs and bark of salmonberry. Salmonberry also provides flower nectar for hummingbirds.

The forbs/grasses provide small amounts of forage for deer and elk. The moist soils provide cool resting spots for deer and elk during hot periods in summer.

Seeps, often associated with the LYMA PA, provide unique habitat for some wildlife species including salamanders, frogs, garter snakes, and several species of shrews and voles. If down wood or boulders are present, VanDyke's salamander (*Plethodon vandykei*) and/or Dunn's salamander (*P. dunni*) may occur. Both species are listed as species of concern by the State of Washington.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The LYAM PA often occurs in conjunction with conifer forest wetland associations of the Western Hemlock (Halverson and others, 1986; Topik and others, 1986) and Grand Fir (Topik and others, 1988 and 1989) Zone associations or conifer-dominated riparian types. Those types most commonly associated with the LYAM PA include Western Hemlock/Skunkcabbage (TSHE/LYAM), Grand Fir-Western Redcedar/Skunkcabbage (ABGR-THPL/LYAM), Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4) and Western Redcedar-Grand fir/Vanillaleaf (THPL-ABGR/ACTR) . In this sample it also occurred adjacent to cool shrubby streambank fringe and Cooley's hedgenettle types -- the Mountain Alder-Ovalleaf Huckleberry (ALIN-VAOV), Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV), Cooley's Hedgenettle-Ladyfern (STCO4-ATFI), and Cooley's Hedgenettle-Yellow Monkeyflower (STCO4-MIGU) types.

UPLAND -- The LYAM PA occurs adjacent to a wide range of cool, mesic to moist Western Hemlock, Pacific Silver Fir and Grand Fir Zone plant associations. The most common in this sample was the Pacific

Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA; Hemstrom and others, 1982) association.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The LYAM PA may be confused with the ABGR-THPL/LYAM PA, but can be distinguished from it by the lack of a well-developed tree layer.

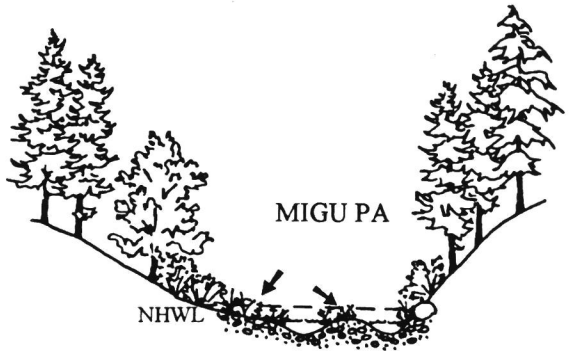
RELATIONSHIPS TO OTHER CLASSIFICATIONS -- A LYAM PA has not been described elsewhere in the Pacific Northwest.

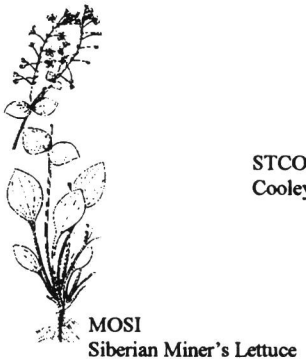
MIGU PLANT ASSOCIATION

FW4224

Mimulus guttatus
Yellow Monkeyflower

No. Plots = 18




MOSI
Siberian Miner's Lettuce

STCO4
Cooley's Hedgenettle

MIGU
Yellow Monkeyflower

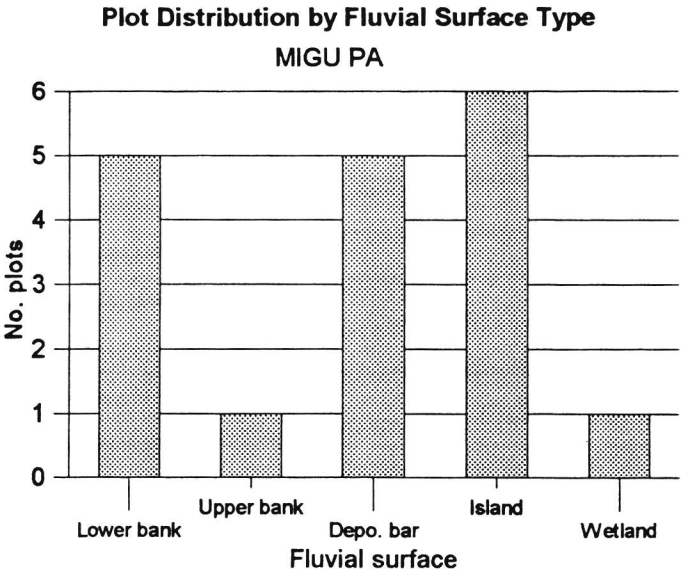
GLEL
Sweet Manna-grass

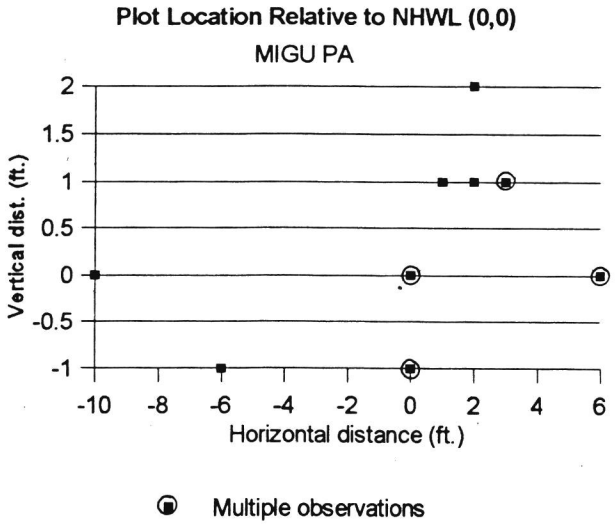
VEGETATION COMPOSITION AND STRUCTURE -- The MIGU plant association (PA) is a moderate to dense community of forbs and grasses. Moss cover is variable. The dominant plant is yellow monkeyflower (MIGU), which averaged 20% foliar cover on plots in this sample. Common associated species include tall mannagrass (GLEL), springbeauty (MOPA), Cooley's hedgenettle (STCO4) and claspleaf twistedstalk (ARAM). There was an average of 12.9 vascular plant species per plot in this sample, with an average of 6.1 dominant species. This is low overall species richness for riparian types in this area, but higher-than-average dominance, indicating that there are several species that share predominance in this community.

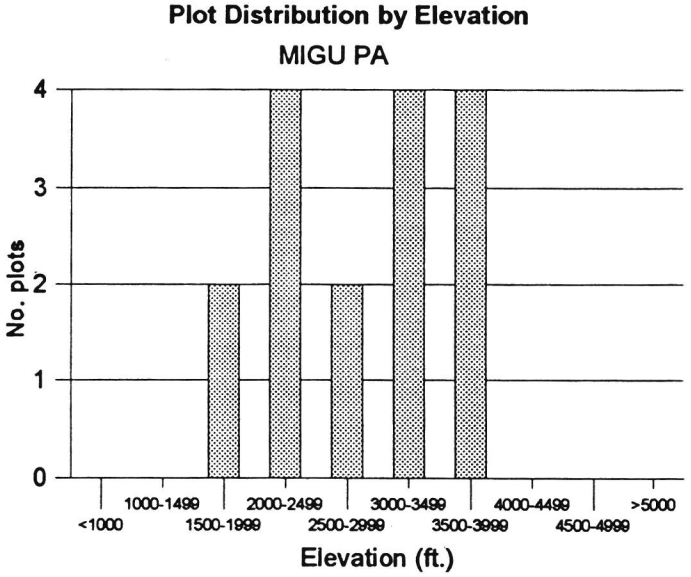
SPECIES	CODE	CONS.	%COV.
Forbs			
Arnica amplexicaulis	ARAM	28	9
Epilobium glaberrimum	EPGL2	28	4
Galium triflorum	GATR	35	1
Mimulus guttatus	MIGU	100	20
Montia parvifolia	MOPA	39	7
Montia sibirica	MOSI	28	4
Stachys cooleyae	STCO4	33	3
Grasses/grasslikes			
Glyceria elata	GLEL	44	6
Moss		61	39
Bare soil/sand		61	6
Gravel		50	26
Cobbles		67	32
Rock		61	47

ENVIRONMENT AND DISTRIBUTION -- The MIGU PA represents very wet, frequently inundated riparian sites with coarse alluvium. One ecotype, the MIGUGravel/Cobble ET, is described for the MIGU PA. In this sample, it occurred on saturated gravels and cobbles within the bankfull zone on a variety of flat alluvial landforms, most commonly depositional bars/islands and lower streambanks. The vegetation is generally partially submerged in or very near flowing water (within the splash zone). The substrates in our

sample of this type were composed of gravels or cobbles, occasionally with a thin (<5 cm.) layer of sand. Most plots had considerable unvegetated gravel or rock. The substrates were unusual in that they consisted of a single layer of coarse particles over bedrock; most other sites sampled had multiple layers sorted by particle size. MIGU sites have a high degree of fluvial activity, which keeps the finer particles moving downstream. MIGU PA represents a vegetation community that is adapted to a highly dynamic situation, with substrate renewal probably occurring on a seasonal basis. Yellow monkeyflower is an annual, but also readily produces stolons, so is well-adapted to proliferate on recent fluvial surfaces, as long as the substrate remains saturated. The plots in this sample occurred







mostly at mid-elevations (1500-4000 feet) throughout the sample area on both sides of the Cascade crest. Channels with some development of floodplain features (Rosgen B and C channel types) predominated.

MANAGEMENT IMPLICATIONS -- The MIGU PA appears to represent the potential vegetation community on saturated sites within the bankfull zone that experience disturbance of the substrate on a seasonal basis, but still have the ability to support vegetation. If the substrate were not saturated, these sites would likely be nonvegetated or support the HYPE PC or EQAR PA. The stoloniferous habit of yellow monkeyflower allows it to develop significant cover during the growing season (up to 70% foliar cover in this sample) which may enhance deposition of fine materials and organic matter and in some cases may contribute to aggradation and surface stabilization of fluvial landforms. As a rule, however, these are dynamic sites that recycle the substrate frequently.

The MIGU PA does not contribute to accumulation of large woody debris, to stream shading or slope stabilization. It contributes a small amount of foliar debris to the stream.

These are sites that are likely to be difficult to revegetate or stabilize after ground disturbance, and are dependent on saturation during the growing season to support vegetation.

WILDLIFE HABITAT RELATIONSHIPS -- The flat alluvial landforms that the MIGU PA is associated with usually provide resting areas for deer and elk, especially in summer when riparian areas provide relief from the heat. However, in areas that are partially submerged, use of the sites for bedding would be limited. The habitat provides a limited amount of summer forage.

Depositional bars/islands provide resting spots for waterfowl that offer some protection from mammalian predators. Boulders and rock outcrops provide hiding cover for amphibians, reptiles, and small mammals. Spaces between cobble and gravel deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The MIGU PA occurred adjacent to a wide range of riparian vegetation types indicative of cool-wet environments. The most common were devilsclub (OPHO)-dominated associations: Devilsclub (OPHO), Pacific Silver Fir/Devilsclub (ABAM/OPHO) and Red Alder/Devilsclub (ALRU/OPHO). The Sitka Alder (ALSI) and Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV) associations were also frequently found with the MIGU PA.

UPLAND -- Upland plant associations found adjacent to the MIGU PA were extremely variable, and represented a wide range of environments in the Western Hemlock (Halverson and others, 1986; Topik and others, 1986), Pacific Silver Fir (Hemstrom and others, 1982; Brockway and others, 1983) and Grand Fir Zones (Topik and others, 1988 and 1989). The most common were the Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA), Pacific Silver Fir/Rhododendron-Alaska Huckleberry/Bunchberry Dogwood (ABAM/RHMA-VAAL/COCA) and the Grand Fir/Elk Sedge (ABGR/CAGE) associations.

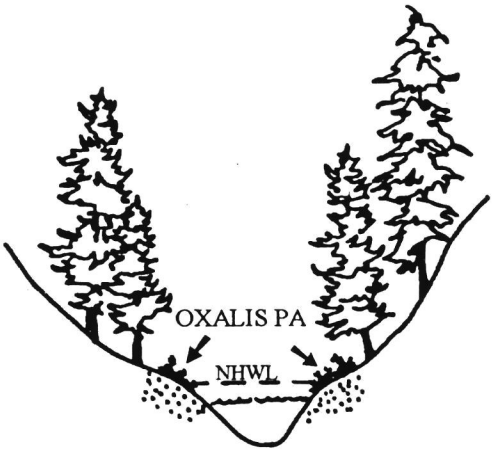
SIMILAR RIPARIAN TYPES IN THIS AREA -- The MIGU PA may be confused with the STCO4-MIGU PA, and can be distinguished from it by the dominance of the STCO4-MIGU PA by Cooley's hedgenettle.

RELATIONSHIP TO OTHER CLASSIFICATIONS -- A GLEL (tall mannagrass) PA with somewhat similar species composition and site characteristics to our MIGU PA was described in Eastern Oregon by Crowe and Clausnitzer (1996), but it lacks the dominance of yellow monkeyflower and contains associated species not found in our type.

OXALIS PLANT ASSOCIATION
Oxalis oregana-Oxalis trilliifolia
Oregon Oxalis-Great Oxalis

FW4225

No. Plots = 9

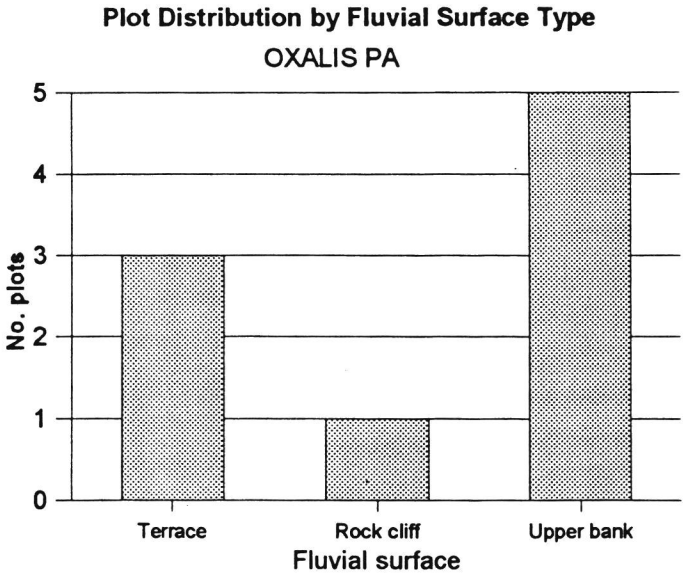


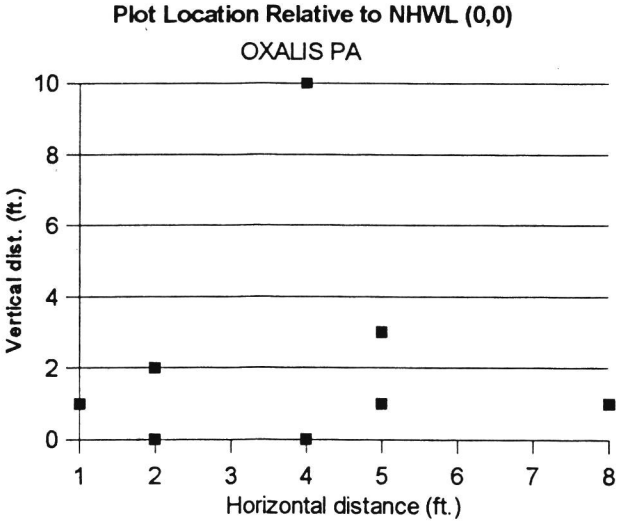
VEGETATION COMPOSITION AND STRUCTURE -- The OXALIS plant association (PA) consists of a dense low forb and moss community dominated by one or both of two species of oxalis, Oregon oxalis (OXOR) and great oxalis (OXTR). In this sample the two oxalis species appeared to represent identical environments; they are somewhat difficult to distinguish unless flowers and roots are examined, and so are lumped together in this association. Scouler's corydalis (COSC) is a common co-dominant, and significant amounts of ladyfern (ATFI) and Cooley's hedgenettle (STCO4) frequently occur. Small amounts of salmonberry (RUSP) may be present. Moss cover is usually well-developed, although was occasionally lacking in this sample. There was an average of 14.1 vascular plant species per plot in this sample, with an average of 4.8 dominant species. This is slightly lower richness and dominance than is characteristic for riparian types overall in this area.

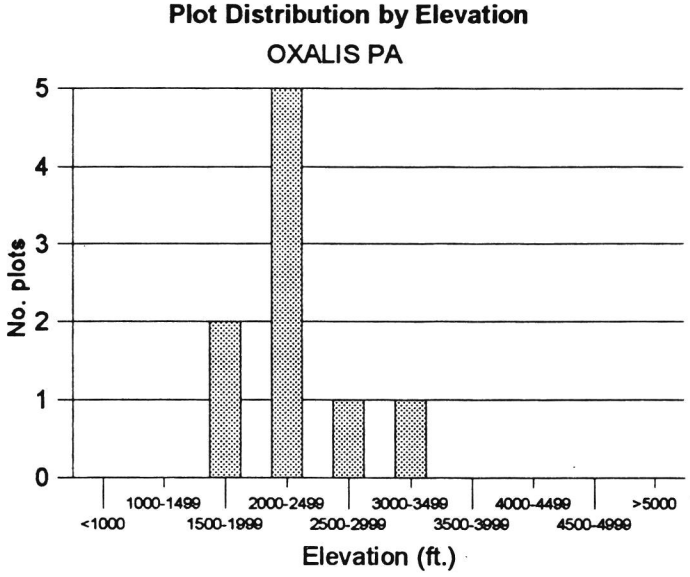
SPECIES	CODE	CONS.	%COV.
Shrubs			
Rubus spectabilis	RUSP	56	2
Forbs			
Athyrium filix-femina	ATFI	78	4
Corydalis scouleri	COSC	56	43
Galium triflorum	GATR	44	2
Oxalis oregana	OXOR	44	15
Oxalis trillifolia	OXTR	44	38
Stachys cooleyae	STCO4	67	7
Tolmiea menziesii	TOME	44	2
Moss		78	51
Bare soil/sand		56	14
Gravel		22	7
Cobbles		33	17
Rock		67	9

ENVIRONMENT AND DISTRIBUTION -- The OXALIS PA reflects moist, shady toe-slope environments with productive soils and a long growing season. It is represented by one ecotype, the OXALIS

Streambank/Terrace ET. Although streambanks and terraces are technically two different landforms, where the OXALIS PA is found it is difficult to differentiate functionally between them because the slope steepness, substrate, and hydrology are very similar. They are therefore combined into one ecotype. In this sample, the OXALIS Streambank/Terrace ET occurred as a narrow fringe of herbaceous vegetation on gently sloping (rarely steep) streambanks and terraces at the lower edge of the floodprone zone, above but near (generally 1-3 feet) the normal high-water line. Plots fell mostly within narrow (30-40 feet wide in this sample), entrenched steep-gradient channels (Rosgen A channel type), or occasionally channels with some floodplain features (narrower Rosgen B and C channels). Coniferous forest vegetation was frequently adjacent, providing significant shade. In this sample,







the substrate was characteristic of lower slope upland forest soils - mostly various layers of silts, silt/sand and volcanic ash several cm. thick (up to 100 cm.) over rock or rarely cobbles. Organic matter was abundant, and well-incorporated into the mineral soil. Soil moisture retention and drainage were favorable for vegetation growth. The OXALIS PA occurred at low to moderate elevations (1500 to 3500 feet) in drainages throughout the study area west of the Cascade crest. In general, oxalis communities increase in abundance towards the western boundaries of the Gifford Pinchot and Mt. Hood National Forests. A similar plant community has been observed farther south in the Cascades of Oregon, on the Willamette National Forest, but environmental and successional parallels with the OXALIS PA have not been established.

MANAGEMENT IMPLICATIONS -- The OXALIS PA probably represents the vegetation potential on sites where it occurs. It can be viewed as a proliferation of the understory of the adjacent conifer stand where a canopy opening has been created by the stream.

Productivity is high, since soil moisture and decomposed organic matter are abundant. Shading, large woody debris input and slope stabilization from the adjacent conifer stand is likely to be significant. The OXALIS PA contributes little foliar input to the stream.

These areas tend to revegetate quickly after ground disturbance, especially if the surrounding canopy is opened up. Under such circumstances, shrub cover can be expected to increase dramatically, with species such as salmonberry (RUSP), thimbleberry (RUPA), stinkcurrant (RIBR), Alaska huckleberry (VAAL), vine maple (ACCI), and (in wetter sites) devilsclub (OPHO) becoming predominant in the early stages of succession. Sites with the OXALIS Streambank/Terrace ET may be at risk of soil compaction with heavy equipment use. In addition, if soil displacement occurs, these areas are likely to provide a significant source of fine sediments to the adjacent stream. Risk would be highest on steeper slopes or where surface runoff from a high water table is especially likely (indicated by the presence of hydrophytic plants such as devilsclub, salmonberry or skunkcabbage (LYAM)).

WILDLIFE HABITAT RELATIONSHIPS -- Wildlife habitat in the OXALIS PA is limited by lack of structural diversity. Where salmonberry occurs, it provides some structure and small amounts of browse for deer and berries for birds and mammals. The presence of large wood debris provides micro sites and cover for amphibians, reptiles and small mammals. Moss cover provides habitat for insects consumed by insectivorous wildlife such as shrews and amphibians.

The gently sloping streambanks and terraces provide cool resting sites for deer and elk during the summer. When the sites are free of snow they provide some winter forage for deer and elk. The sites lack winter thermal cover but are probably grazed opportunistically as animals pass through the habitat.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The most common riparian vegetation types associated with the OXALIS PA in this sample were the Maidenhair fern (ADPE), Red Alder/Salmonberry/Oxalis (ALRU/RUSP/OXOR) and Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) plant associations. Several Red Alder-dominated types occurred as well, in addition to the Western Hemlock/Skunkcabbage (TSHE/LYAM; Halverson and others, 1986) plant association.

UPLAND -- The OXALIS PA in this sample occurred most commonly adjacent to moist, productive Western Hemlock (Halverson and others, 1986; Topik and others, 1986)and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) upland plant associations; Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR), Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL), Western Hemlock/Alaska Huckleberry/Oxalis (TSHE/VAAL/OXOR), and devilsclub-dominated associations were most frequently observed.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The OXALIS PA may be confused with the following types, and can be distinguished from them as noted below:

- □ THPL/RUSP/OXALIS PC - has well-developed tree and shrub layers
- □ ALRU/OPHO PC - red alder and devilsclub are dominants
- □ ALRU/OXALIS PC - red alder is dominant
- □ ALRU/RUSP/OXALIS PC - has well-developed tree and shrub layers
- □ OPHO PA - devilsclub is dominant; wetter sites
- □ RIBR-RUSP/OXALIS PA - has a well-developed shrub layer

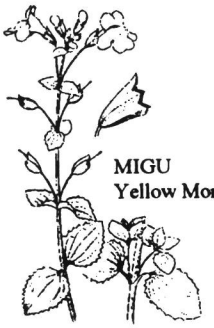
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The OXALIS PA has not been described elsewhere in the Pacific Northwest.

PEFR2 PLANT COMMUNITY

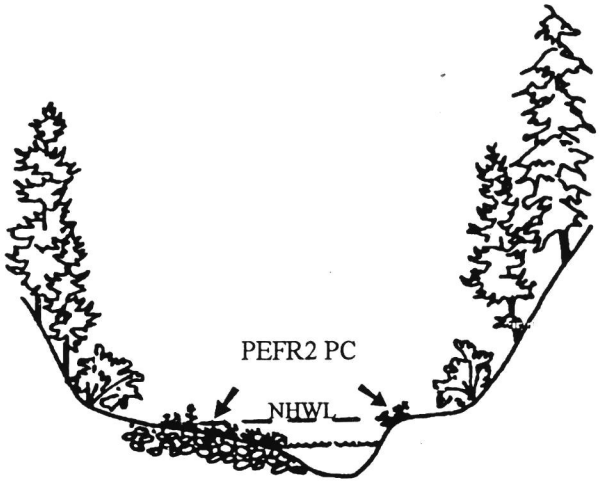
Petasites frigidus
Coltsfoot

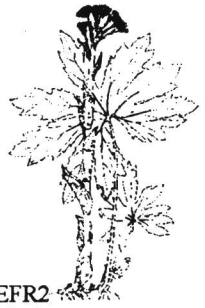
No. Plots = 34

FW4226



MIGU
Yellow Monkeyflower





PEFR2
Coltsfoot

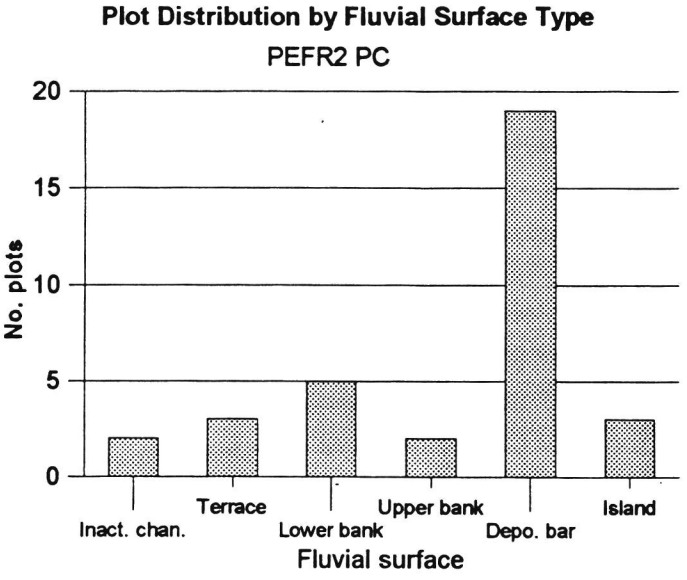
GATR
Sweetscented
Bedstraw

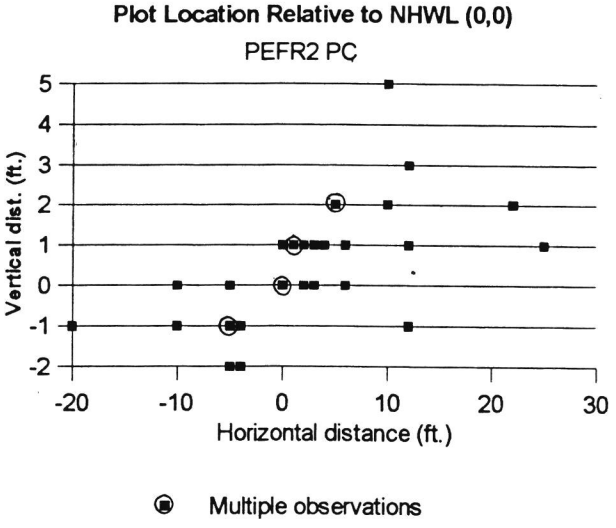
VEGETATION COMPOSITION AND STRUCTURE -- The PEFR2 plant community (PC) consists of a layer of low forbs, moderate to dense in foliar cover. Moss cover is variable and scattered shrubs may be present. The dominant plant species is coltsfoot (PEFR2), which is often accompanied by small amounts of Cooley's hedgenettle (STCO4), monkeyflower (MIGU), sweetscented bedstraw (GATR) and ladyfern (ATFI). Sparse shrub-form red alder (ALRU) and stinkcurrant (RIBR) may be present. An average of 15.0 vascular plant species was found per plot in this sample, with an average of 4.6 dominant species. These values are slightly lower than average for riparian types as a whole in this area.

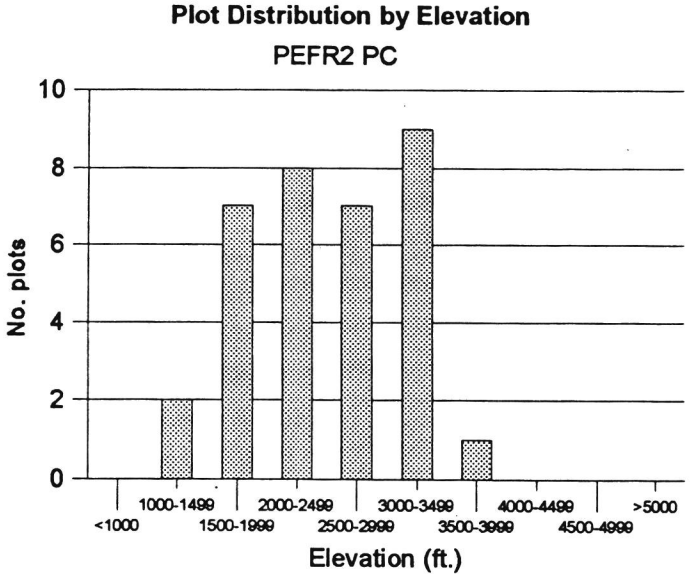
SPECIES	CODE	CONS.	%COV.
Shrubs			
Alnus rubra	ALRU	47	2
Ribes bracteosum	RIBR	47	3
Forbs			
Athyrium filix-femina	ATFI	38	2
Galium triflorum	GATR	47	2
Mimulus guttatus	MIGU	44	5
Montia parvifolia	MOPA	35	1
Montia sibirica	MOSI	32	1
Petasites frigidus	PEFR2	100	39
Stachys cooleyae	STCO4	65	4
Moss		38	30
Bare soil/sand		44	8
Gravel		74	16
Cobbles		88	23
Rock		59	12

ENVIRONMENT AND DISTRIBUTION -- The PEFR2 PC is one of the most widespread riparian vegetation communities on the Gifford Pinchot and Mt. Hood National Forests, and is found in drainages throughout the study area, on both sides of the Cascade crest. A similar community has been observed farther south in the Cascades in Oregon, on the Willamette National Forest, but environmental and successional parallels to the PEFR2 PC have not been established. In this sample the PEFR2 PC always occurred below 4000 feet in elevation on cobble deposits

(occasionally with a thin layer of sand) that have a saturated root zone for most of the growing season, even though the surface is often extremely droughty. Soil development and organic matter accumulation are negligible. The PERF2 PC in this sample occurred on relatively stable cobble (rarely gravel) bars at or near the normal high-water line, in a wide range of channel types and widths (active channel width varied from 25 to 400 feet in this sample). Within the bankfull zone, the PEFR2 PC occupied lower streambanks, bars and islands that are likely to be inundated every 1 or 2 years. Above the bankfull zone, it occurred on flood deposits from major high flow events such as the 1964 floods in Oregon, and the floods of the 1970's in Washington, typically terraces, upper streambanks or inactive channels. In general these







floodprone zone sites were within a foot or two above the normal high-water line.

MANAGEMENT IMPLICATIONS -- The successional status of the PEFR2 PC probably varies among sites. It likely represents the potential vegetation within the bankfull zone, and in sites within the floodprone zone that are subject to intense high flows every few years. The cobble deposits in these sites are likely so slow to develop vegetation that they are recycled by 10- to 50-year flood events before significant succession can occur. In less-frequently flooded sites (for example, that were disturbed several years to decades ago), it may be successional to another riparian type, such as the ALRU/PEFR2 PC. In this sample, these was no more evidence of plant community succession (e.g., shrub or conifer seedlings) in the floodprone zone than in the bankfull zone.

Maintenance of moisture in the rooting zone is critical to the survival of coltsfoot and the other species that occupy these sites. If the water table is lowered, it is likely that the surfaces would remain unvegetated for a considerable period. Revegetation is likely to be difficult, but where a shrub component is desired, red alder cuttings may do well if planted early in spring.

Lacking a tree or shrub component, the PEFR2-Cobble ET does not offer a source of large wood, shade or slope stability. The vegetation can be a source of foliar input to the stream during periods of high flow and may in some cases entrap fine materials and organic debris.

WILDLIFE HABITAT RELATIONSHIPS -- Lack of structural diversity limits wildlife habitat in the PEFR2 PC. On some sites scattered red alder and stinkcurrant provide some cover and perch sites for birds. Small amounts of preferred forage species occur and are probably grazed opportunistically as animals pass through the habitat. Spaces between cobble deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The PEFR2 PC is widespread, and occurs adjacent to a large number of other riparian communities. It is most frequently associated with red alder, stinkcurrant-salmonberry or devilsclub riparian types. The most common are Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS), Stinkcurrant-Salmonberry/Coltsfoot (RIBR-RUSP/PEFR2), Devilsclub (OPHO) and Red Alder/Coltsfoot (ALRU/PEFR2). The Cooley's hedgenettle types -- Cooley's Hedgenettle /Monkeyflower (STCO4-MIGU) and Cooley's Hedgenettle /Ladyfern (STCO4-ATFI) -- are also often found with the PEFR2 PA.

UPLAND -- Upland plant associations that reflect moist, productive conditions are most often found adjacent to sites with the PEFR2 PA. The most common in the Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) are Western Hemlock/Swordfern-Oregon Oxalis (TSHE/POMU-OXOR) association along with herb-rich types dominated by Alaska huckleberry and devilsclub: Western Hemlock/Alaska Huckleberry/Bunchberry Dogwood (TSHE/VAAL/COCA), Western Hemlock/Alaska Huckleberry/Oxalis (TSHE/VAAL/OXOR), and Western Hemlock/Devilsclub/Oxalis (TSHE/OPHO/OXOR). In the Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983), the Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE), Pacific Silver Fir/Alaska Huckleberry (ABAM/VAAL) and Pacific Silver Fir/Devilsclub (ABAM/OPHO) associations frequently occur adjacent to the PEFR2 PA.

SIMILAR RIPARIAN TYPES IN THIS AREA --

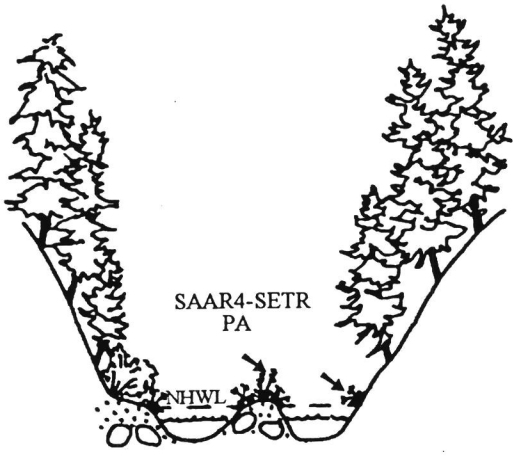
- ALRU/PEFR2 PC - has a well-developed tree layer dominated by red alder
- RIBR-RUSP/PEFR2 PA - has a well-developed shrub layer dominated by stinkcurrant and salmonberry
- EQAR PA - has common horsetail as a dominant plant species

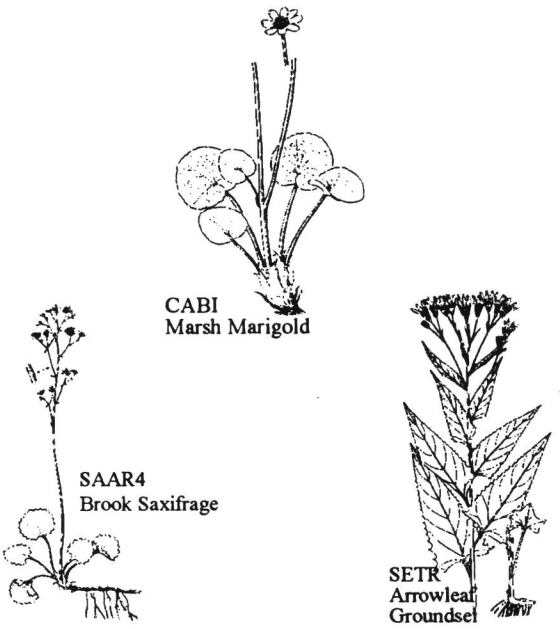
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The PEFR2 PC has not been described elsewhere in the Pacific Northwest.

SAAR4-SETR PLANT ASSOCIATION
Saxifraga arguta-Senecio triangularis
Brook saxifrage-Arrowleaf groundsel

FW4227

No. Plots = 8



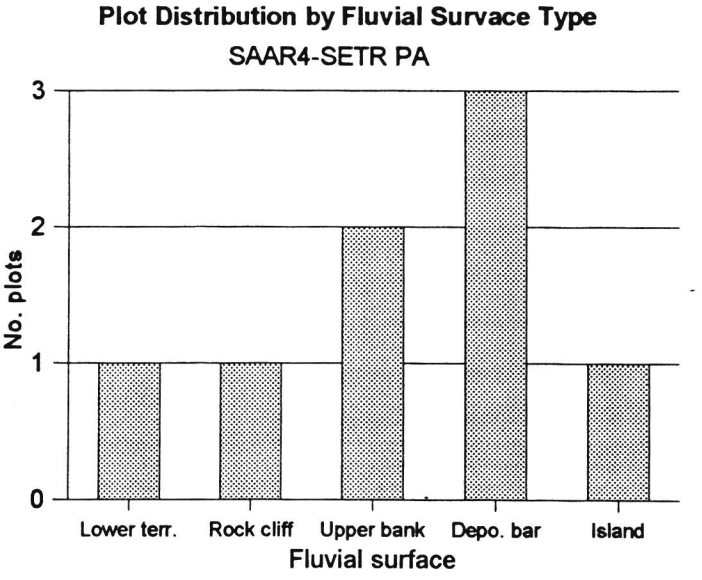


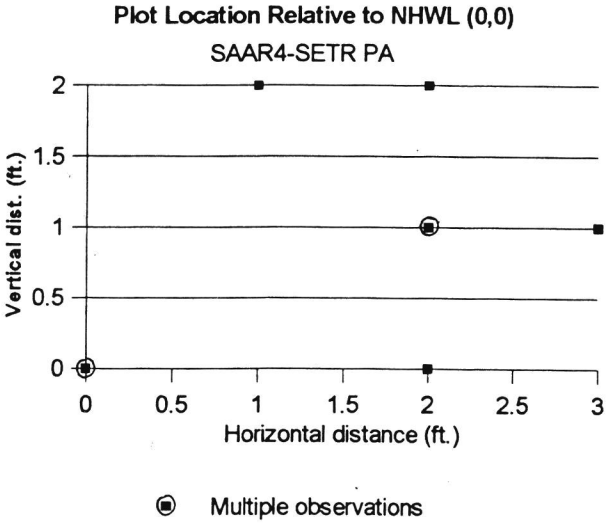
VEGETATION COMPOSITION AND STRUCTURE -- The SAAR4-SETR plant association (PA) is a dense, lush community of medium-tall forbs, often with scattered conifer seedlings or shrubs. Moss cover is generally well-developed. The dominant plant species are brook saxifrage (SAAR4) and arrowleaf groundsel (SETR), frequently associated with coolwort foamflower (TITRU) and alpine willow-weed (EPAL). White marsh marigold (CABI) may be locally abundant, and other moist-site herbs are often present. Prickly currant (RILA) is the most frequently-encountered shrub but rarely exceeds 5% foliar cover. Small amounts of stinkcurrant (RIBR), salmonberry (RUSP) or Sitka alder (ALSI) may occur, as well as seedlings of Pacific silver fir (ABAM) and western hemlock (TSHE). An average of 16.5 vascular plant species occurred on plots in this sample, with an average of 6.5 dominant species. This is average species richness and dominance for riparian types overall.

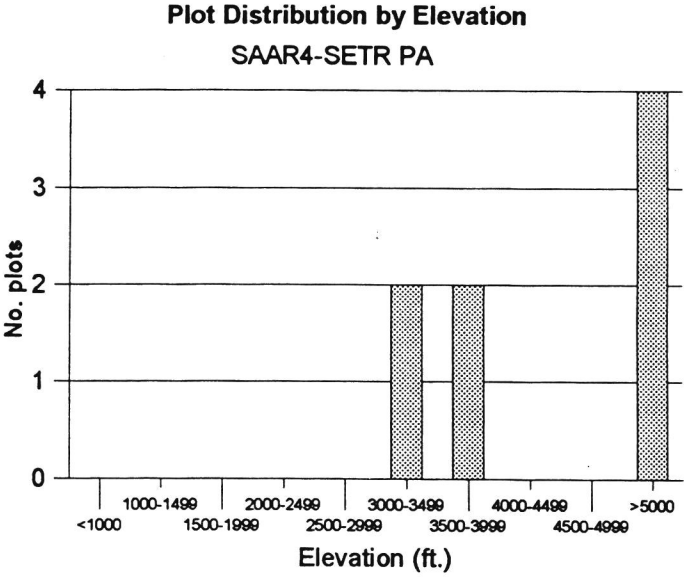
ENVIRONMENT AND DISTRIBUTION -- The SAAR4-SETR PA is a community of cool, moist,

SPECIES	CODE	CONS.	%COV.
Trees (regen.)			
Abies amabilis	ABAM	38	4
Tsuga heterophylla	TSHE	38	4
Shrubs			
Alnus sinuata	ALSI	38	4
Ribes bracteosum	RIBR	38	10
Ribes lacustre	RILA	63	12
Rubus spectabilis	RUSP	38	9
Forbs			
Caltha biflora	CABI	50	15
Circaea alpina	CIAL	50	3
Epilobium alpinum	EPAL	63	3
Mimulus guttatus	MIGU	38	2
Saxifraga arguta	SAAR4	100	24
Senecio triangularis	SETR	100	10
Tiarella tri. var. unifol.	TITRU	63	7
Viola glabella	VIGL	38	3
Moss		75	53
Bare soil/sand		75	10
Gravel		25	5
Cobbles		50	11
Rock		88	17

productive sites and finer-textured substrates found in the upper reaches of streams within the study area. In this sample, it generally occurred in steep to moderate-gradient, incised to somewhat alluviated channels (Rosgen A and B channel types, occasionally Cs). Substrates were usually sand or silt, sometimes over a layer of cobbles. Bare or litter-covered rock was frequently present, but was normally <15% cover of the ground surface. One ecotype, the SAAR4-SETR Alluvial Silt/Sand ET, is described for this plant association. Depositional bars, low islands and gentle to moderately-sloping streambanks are the most common landforms. The plots in this sample were all within the floodprone zone, but occurred primarily within 1 foot above and 2 feet or less horizontal distance from the normal high-water







line, within the splash zone. The lush vegetation and well-developed moss cover this close to the normal high-water line suggest low seasonal fluctuation in stream flow, but these sites may be "refreshed" by low intensity flooding every few decades. The substrate remains moist season-long and may be saturated; this is particularly likely where white marsh marigold is present. Sites with the SAAR4-SETR/Alluvial silt/sand ET are commonly shaded by the adjacent forest.

The plots in this sample were located in three widely separated upper-elevation drainages on the west side of the Mt. Hood National Forest, but the SAAR4-SETR Alluvial Silt/Sand ET has been observed in other parts of the study area, both east and west of the Cascade crest. A similar plant community has also been observed farther north on the Mt. Baker/Snoqualmie National Forest, but environmental and successional parallels to the SAAR4-SETR PA have not been determined.

MANAGEMENT IMPLICATIONS -- The SAAR4-SETR PA probably represents the potential vegetation community on sites where it occurs, as long as the hydrologic regime is maintained and substrates remain moist. The presence of conifer seedlings does not seem to indicate succession towards a forest type, but rather incidental reproduction on drier microsites.

These are highly productive, high-biomass herbaceous communities. Lacking trees and shrubs, the SAAR4-SETR Alluvial Silt/Sand ET does not provide large wood, shade or slope stability to streambanks. The low, dense, herbaceous vegetation does contribute to foliar input, and also probably traps fine sediments and organic debris during periods of low intensity inundation. It also helps prevent surface erosion of fine alluvium. Ground disturbance carries a significant risk of soil compaction, erosion and channelization of flow. Site rehabilitation after disturbance may be challenging due to high soil moisture.

WILDLIFE HABITAT RELATIONSHIPS -- The dense forb community provides cover for ground nesting birds, small mammals, amphibians and reptiles. Moss covered rocks provide additional cover for amphibians and reptiles. The moss also provides habitat for invertebrates consumed by insectivorous wildlife. The low amounts of scattered shrubs provide little nesting cover for birds but do provide berries for food. The SAAR4-SETR PA is often found near shrubby riparian sites. This edge between the shrub and forb types provides good habitat for wildlife that forage in the open but require shrub cover for nesting or resting.

Shade provided by adjacent forest provides for cool microclimates. The gently sloping streambanks and depositional bars provide resting sites for deer and elk during summer heat. Small amounts of forage and browse are available.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The SAAR4-SETR PA is often found in combination with cool-site shrubby types - Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV), Sitka Alder (ALSI) and Mountain Alder-Ovalleaf Huckleberry (ALIN-VAOV) - and also the Yellow Monkeyflower (MIGU) association.

UPLAND -- Upland plant associations indicative of cool, moist environments are often adjacent to sites with the SAAR4-SETR PA. In this sample, these were primarily Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) types: Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA), Pacific Silver Fir/Big Huckleberry/Queencup Beadlily (ABAM/VAME/CLUN) and Pacific Silver Fir/Fool's Huckleberry (ABAM/MEFE).

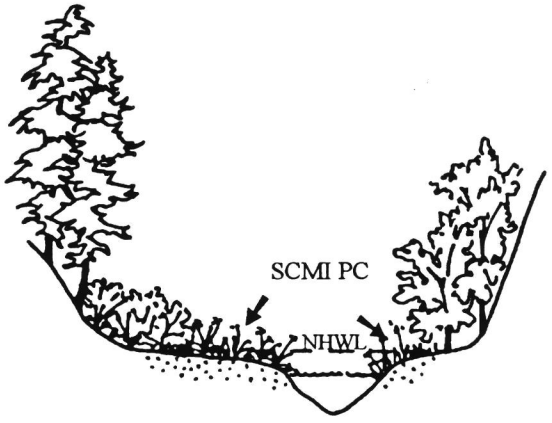
SIMILAR RIPARIAN TYPES IN THIS AREA -- The SAAR4-SETR PA may be confused with the SETR-ASMO PC, which lacks brook saxifrage, has few-flowered aster as a dominant, and often has scattered Douglas' spiraea (SPDO).

RELATIONSHIP TO OTHER CLASSIFICATIONS -- Vegetation communities similar but not identical to the SAAR4-SETR PA have been found in Eastern Oregon. Kovalchik (1987) described a CLUN(ALIN) (Queencup Beadlily (Mountain Alder)) PA, but it lacks arrowleaf groundsel, and has different non-dominant species; substrates and fluvial landforms are different as well. Crowe and Clauznitzer (1996) described a SAAR4 community type in very similar environments to ours, but the associated species are quite different.

SCMI PLANT COMMUNITY **MT1921**

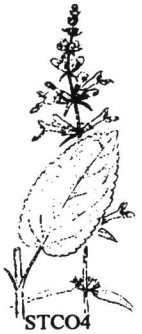
Scirpus microcarpus
Small-fruited bulrush

No. Plots = 3



EQAR
Common Horsetail

SCMI
Small-fruited Bulrush

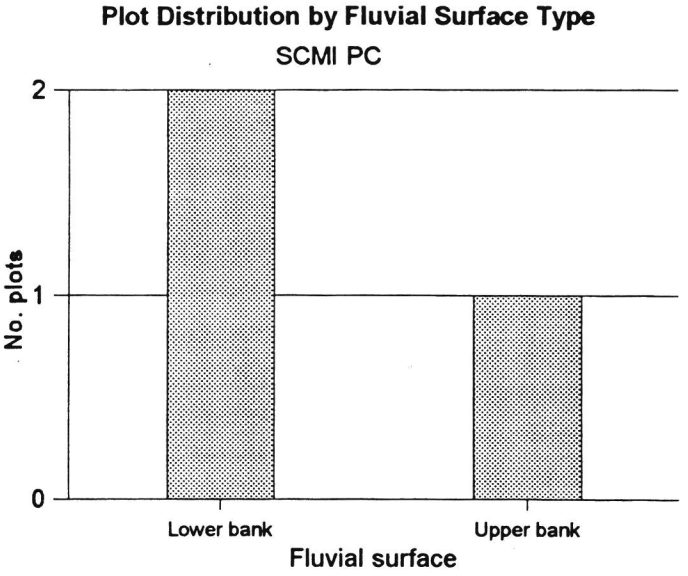

STCO4
Cooley's hedgenettle

VEGETATION COMPOSITION AND STRUCTURE -- The SCMI plant community (PC) consists of a dense community of bulrushes, horsetails and medium to tall forbs. Scattered shrubs may be present, and moss is usually absent (rarely sparse). Small-fruited bulrush (SCMI) strongly dominates the community, and may be associated with Cooley's hedgenettle (STCO4) and common horsetail (EQAR). Red alder (ALRU), salmonberry (RUSP) or Sitka willow (SASI2) may be present in small amounts. There was an average of 10.3 vascular plant species per plot in this small sample of the SCMI PC, with an average of 2.7 dominant species. This represents low overall species diversity relative to riparian types in general, and reflects the strong dominance of small-fruited bulrush in these sites.

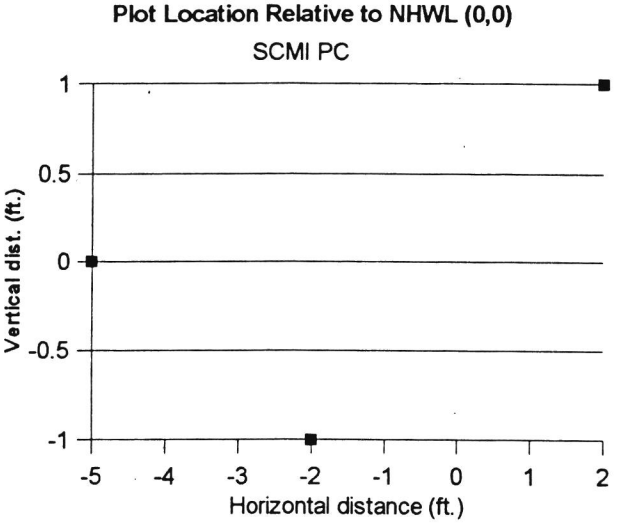
SPECIES	CODE	CONS.	%COV.
Forbs			
Equisetum arvense	EQAR	67	12
Stachys cooleyae	STCO4	67	17
Grasses/grasslikes			
Scirpus microcarpus	SCMI	100	68
Moss		33	2
Bare soil/sand		100	22

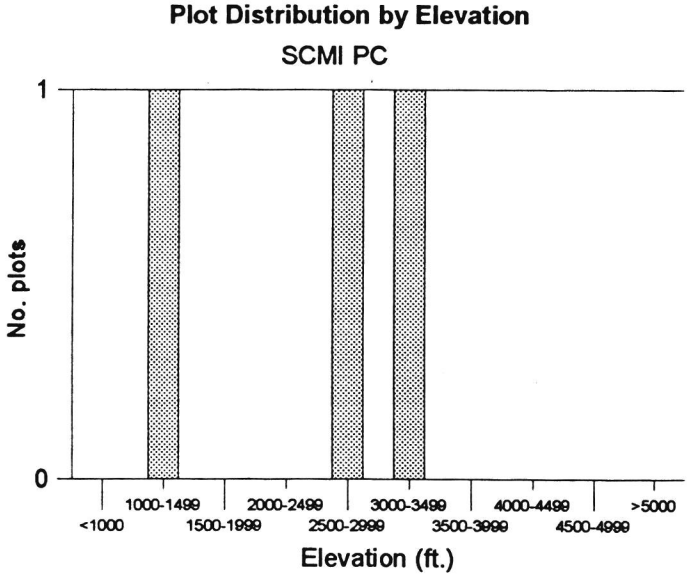
ENVIRONMENT AND DISTRIBUTION -- The SCMI PC represents floodplain wetland sites with fine-textured substrates. In this sample, it occurred on flat to gently-sloping streambanks below to just above the normal high-water line at low to moderate elevations in rather narrow alluviated mountain valleys (Rosgen B channel type). The substrates consisted of combinations of alluvial silts, sands and volcanic ash, 20 to 100 cm. thick. Organic matter was generally abundant. These sites represent wet environments where the soils are moist to saturated year round. The plots in this sample of the SCMI PC were taken from widely separated locations on the Gifford Pinchot NF (Smith and Trout Lake Creeks), but the plant community has been observed in many other locations throughout the study area, both in riparian areas and in wetlands not

associated with streams. Small-fruited bulrush is listed as an "Obligate" wetland indicator (Reed 1988), and its dominance in a plant community implies the site is technically a wetland. A similar plant community has also been observed farther north in the Cascades on the Mt. Baker-Snoqualmie National Forest, and in the Olympic Mountains, but environmental and successional parallels to the SCMI PC have not been established.



MANAGEMENT IMPLICATIONS -- The successional status of the SCMI PC is unclear. Theoretically, over time the aggradation of finer sediments facilitated by the dense vegetation would eventually raise the surface far enough above the water table that small-fruited bulrush would be succeeded by plant species that are more tolerant of drier conditions. On the other hand, the plots in this sample are close enough to the normal high waterline to suggest that these sites are "reset" by flooding frequently enough to preclude such succession. With so few plots, it is impossible to determine the successional status with any degree of certainty, but in any case changes in plant community composition brought about by "upbuilding" are likely to be quite slow due to the frequency of disturbance by the stream.





Lacking a significant shrub or tree component, the SCMI PC does not provide significant large woody debris, shade or foliar input to the stream. The uniformly fine alluvial substrate texture combined with proximity to the normal high waterline suggests that inundation in these sites occurs frequently (annually to every few years), and that flow is both relatively placid and of sufficient residence time to allow for finer sediments to settle out. The density and structure of the graminoid community probably help to decrease the velocity of flow and trap sediments. Roots of bulrush also help stabilize the surface layers of the substrate, and may

cause the streambank to "overhang", creating specialized habitat niches. Sediment entrapment combined with the buildup/decomposition of the dense bulrush litter enhances "upbuilding" of the fluvial surfaces where this plant community occurs, and may help armor the streambanks against surface erosion. Sitka willow, red alder, mountain alder (ALIN) or sitka alder (ALSI) are likely candidates for rehabilitation of disturbed sites or where introduction of a shrub component is desired. The high water table and accumulations of decomposing bulrush organic matter may present a challenge to planting efforts.

WILDLIFE HABITAT RELATIONSHIPS -- The dense community of rushes and forbs in the SCMI CT provides cover for ground nesting birds, small mammals, amphibians and reptiles. Overhanging banks created by the dense roots of bullrush provide excellent fish habitat. Hiding cover is also provided for aquatic amphibians. The low amounts of scattered shrubs provide some cover for a variety of small birds. Where salmonberry occurs, it provides some berries for a variety of wildlife and nectar for hummingbirds.

These flat riparian areas with moist soils do provide cool resting sites for deer and elk during summer heat. Forage is limited to scattered shrubs and some lower value forbs.

The SCMI CT provides habitat for wetland associated wildlife species like frogs, some salamanders, and ducks such as teal and mallard. The Cascades frog (*Rana cascadae)* and spotted frog (*R. pretiosa)* may occur at the higher elevation sites. The frogs are on one or more of the "sensitive" species lists maintained by US Fish and Wildlife Service, Oregon Natural Heritage Program, or the States of Oregon and Washington.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The SCMI PC in this sample was most often found with riparian types that indicate saturated substrates and warmer environments, and that have red alder, salmonberry, stinkcurrant (RIBR) or coltsfoot (PEFR2) as major components. The most common were the Red alder/Thimbleberry (ALRU/RUPA) and Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) types.

UPLAND -- The plots in this sample of the SCMI PC occurred adjacent to the Western Hemlock/Dwarf Oregongrape/Swordfern (TSHE/BENE/POMU; Topik and others, 1986), Pacific Silver Fir/Dwarf Oregongrape (ABAM/BENE; Brockway and others, 1983) and Pacific Silver Fir/Big Huckleberry/Queencup Beadlily (ABAM/VAME/CLUN) plant associations. Since this is a limited sample, it is likely that several other upland plant associations within the Western Hemlock and Pacific Silver Fir Zones can occur alongside the SCMI CT.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The SCMI PC may be confused with the EQAR PA, and can be distinguished from it by the heavy cover of small-fruited bulrush and the comparatively smaller cover of common horsetail.

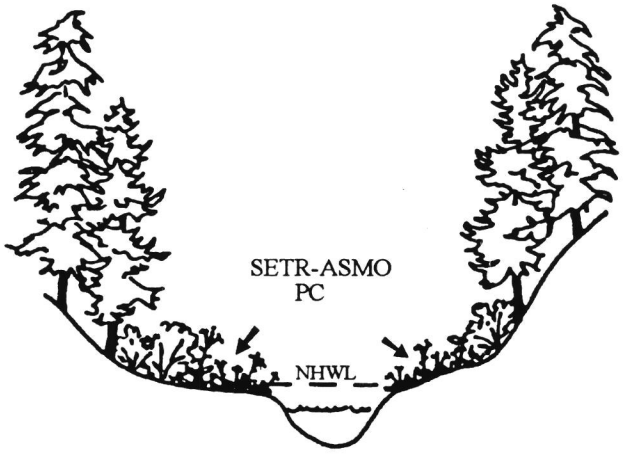
RELATIONSHIP TO OTHER CLASSIFICATIONS -- Two similar types have been described for eastern Oregon: the SCMI (CAAM) (Small-fruited Bulrush (Bigleaf Sedge)) Association (Kovalchik, 1987) and the SCMI (Bulrush) Association (Crowe and Clausnitzer, 1996). Both associations occur in similar environments to our SCMI PC, but non-dominant associated species are different.

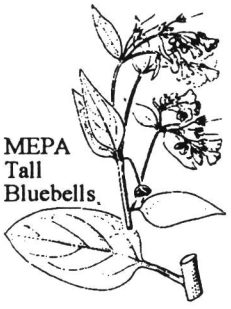
SETR-ASMO PLANT COMMUNITY **FW4228**

Senecio triangularis-Aster modestus

Arrowleaf groundsel-Few-flowered Aster

No. Plots = 9



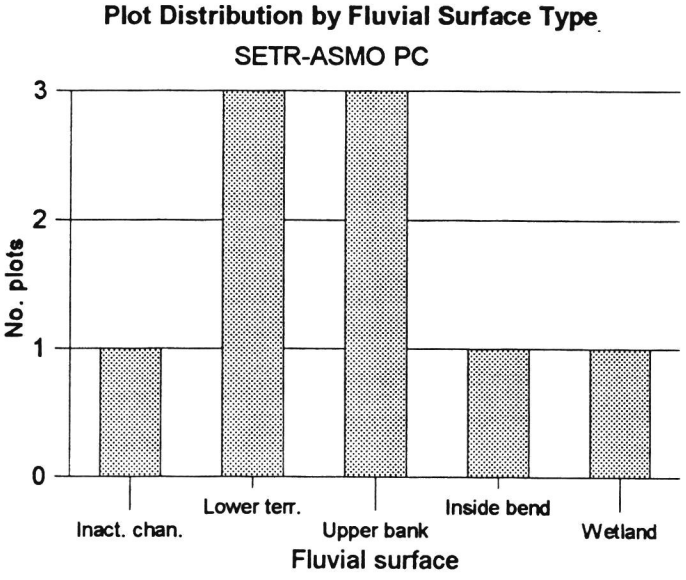


VEGETATION COMPOSITION AND STRUCTURE -- The SETR-ASMO plant community (PC) is a moderate to dense community of medium to tall forbs, often with small amounts of scattered conifer seedlings and broadleaf shrubs. Moss cover is usually greater than 30%, but occasionally as low as 5%. The vegetation is dominated by a mix of species that indicate cool, moist environments. Arrowleaf groundsel (SETR) is always present and is commonly accompanied by few-flowered aster (ASMO), monkshood (ACCO) and streambank groundsel (SEPS). Other species are also frequently found, but less abundant: False bugbane (TRCA3), cow parsnip, (HELA), tall bluebells (MEPA), coolwort foamflower (TITRU), insideout flower (VAHE) and Sitka valerian (VASI). The relative abundance of these species may vary from place to place. Small amounts of Douglas' spiraea (SPDO), ovalleaf huckleberry (VAOV) and ninebark (PHCA3) may be present, along with Engelmann spruce (PIEN) and western hemlock (TSHE) seedlings. The plots in this sample had an average of 21 vascular plant species per plot, with an average of 8.9 dominant species. These are high

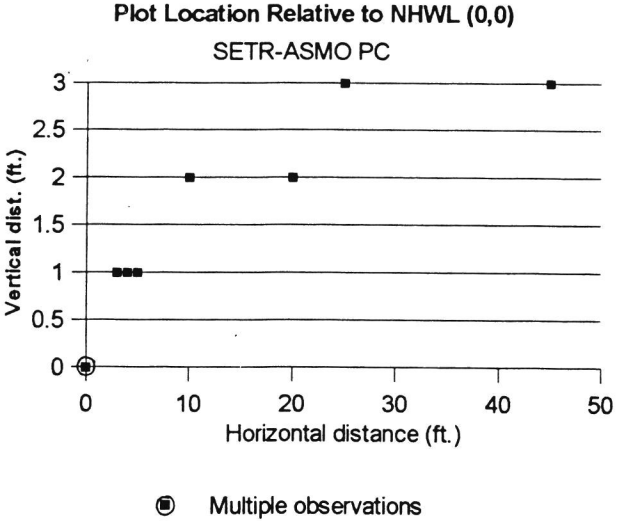
SPECIES	CODE	CONS.	%COV.
Shrubs			
Spiraea douglasii	SPDO	60	4
Forbs			
Aconitum columbianum	ACCO	70	6
Aster modestus	ASMO	70	9
Heracleum lanatum	HELA	60	6
Mertensia paniculata	MEPA	70	2
Senecio pseudaureus	SEPS	60	11
Senecio triangularis	SETR	100	10
Tiarella tri. var. unifol.	TITRU	70	2
Trautvetteria caroliniensis	TRCA3	60	7
Vancouveria hexandra	VAHE	60	5
Valeriana sitchensis	VASI	70	4
Moss		78	36
Bare soil/sand		67	6
Gravel		44	18
Cobbles		44	12
Rock		67	12

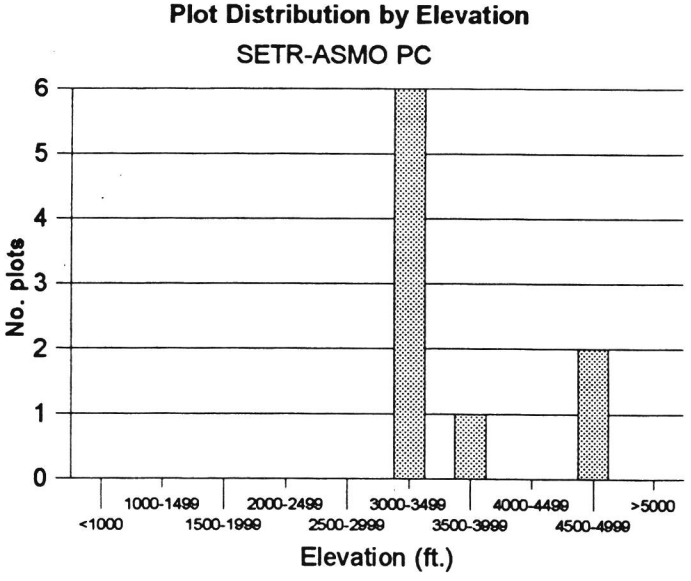
values compared to riparian types overall.

ENVIRONMENT AND DISTRIBUTION -- The SETR-ASMO PC represents cool, moist, productive riparian sites with a relatively short growing season. In this sample, it occurred on flat (rarely sloping) terraces and streambanks within the floodprone zone but not much elevated above the normal high waterline (0-3 feet in this sample), in the upper reaches of moderate gradient, somewhat alluviated slope-bound valleys (Rosgen B and C channel types). The substrate varied from silt-sand-gravel to gravel-cobble mixes; bare soil and rock were minimal.



The SETR-ASMO PC is primarily a "streambank fringe" community. Most of the plots in this sample were within 5 feet lateral distance from the stream but a few were 20 to 45 feet away; these more distant plots were significantly more likely to have conifer seedlings. The SETR-ASMO PC was found at





moderate to upper elevations in the Clackamas River drainage and on the eastern slopes of the Cascades on the Mt. Hood National Forest, but is likely to occur in cool riparian environments throughout the study area.

MANAGEMENT IMPLICATIONS -- The successional status of the SETR-ASMO PC is unclear. The presence of conifer seedlings may be incidental, that is, they may be restricted to drier or warmer microsites. On the other hand, succession towards a conifer-dominated plant community may occur. The plots in this sample do not point towards a clear conclusion of this question.

The SETR-ASMO PC does not contribute significantly to stream shading, input of large woody debris or

slope stability. It does offer a moderate level of input of herbaceous foliage to the stream, and helps reduce surface erosion of fine sediments during periods of inundation. Rehabilitation of SETR-ASMO sites is likely to be easiest where the substrate is not dominated by cobbles. If a shrub component is desired, the best candidates are Douglas' spiraea and ovalleaf huckleberry; mountain and Sitka alder (ALIN, ALSI) are also appropriate and would probably do well. Ground disturbance of finer substrates carries a risk of erosion and sedimentation.

Cold-water corydalis (COAQ), a sensitive plant species, was frequently found in proximity to the SETR-ASMO CT, on gravel substrates closer to the normal high-water line.

WILDLIFE HABITAT RELATIONSHIPS -- The dense community of forbs in SETR-ASMO PC provides cover for ground nesting birds, small mammals, amphibians and reptiles. The low amounts of scattered shrubs provide some cover for a variety of small birds. On some sites, huckleberry provides some berries for food for a variety of wildlife. The SETR-ASMO PC is frequently found near shrubby riparian sites. This edge between the shrub and forb types provides good habitat for wildlife, such as songbirds, rabbits and hares, which forage in the open but require shrub cover for nesting or resting.

These flat riparian areas with moist soils provide cool resting sites for deer and elk during summer heat. Quality of browse provided by the scattered shrubs is fairly low. However, the forb layer provides a number of higher quality forage species for summer grazing.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The SETR-ASMO PC was frequently found in conjunction with cool-moist site shrubby riparian types. The Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV) and Mountain Alder-Ovalleaf Huckleberry (ALIN-VAOV) associations were most common.

UPLAND -- The SETR-ASMO plots in this sample frequently occurred in sites where there was a rather sharp distinction between the riparian and upland communities. Adjacent upland vegetation was indicative of cool, dry environments within the Western Hemlock (Halverson and others, 1986; Topik and others, 1986) and Pacific Silver Fir Zones (Hemstrom and others, 1982; Brockway and others, 1983). The most common upland plant associations were Western Hemlock/Big Huckleberry/Beargrass (TSHE/VAME/XETE) and Pacific Silver Fir/Big Huckleberry/Beargrass (ABAM/VAME/XETE).

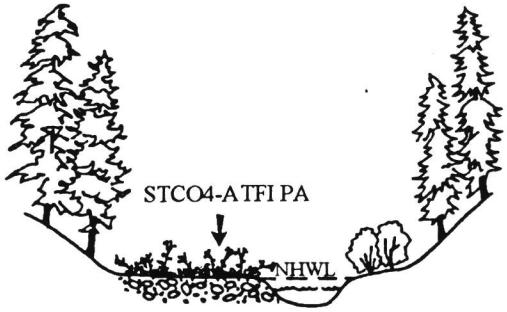
SIMILAR RIPARIAN TYPES IN THIS AREA -- The SETR-ASMO PC may be confused with the SAAR4-SETR PA, which is dominated by brook saxifrage (SAAR4) and generally lacks few-flowered aster.

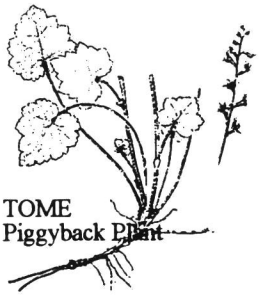
RELATIONSHIP TO OTHER CLASSIFICATIONS -- Kovalchik (1987) and Crowe and Clausnitzer (1996) both described a SETR plant association for eastern Oregon. Their types have some species in common with the SETR-ASMO PC and occur on similar fluvial landforms, but the community composition is not identical to our type, and they tend to be found at higher elevations.

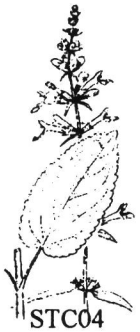
STCO4-ATFI PLANT ASSOCIATION
Stachys cooleyae-Athyrium filix-femina
Cooley's Hedgenettle-Ladyfern

FW4229

No. Plots = 8





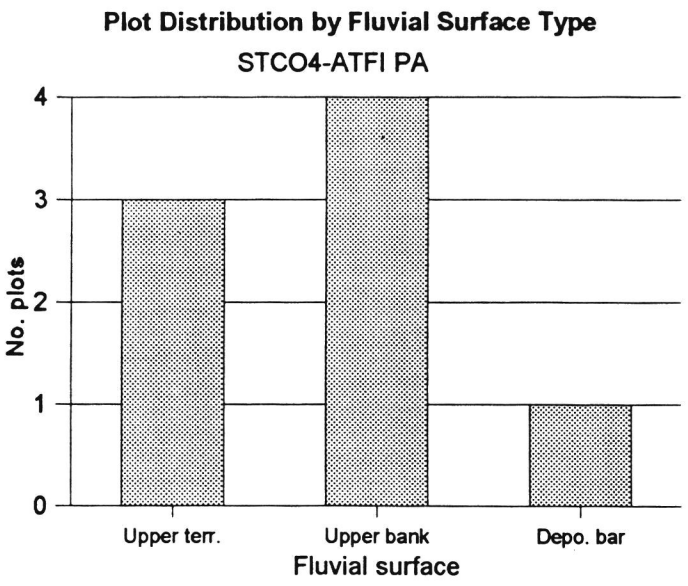

STCO4
Cooley's Hedgenettle

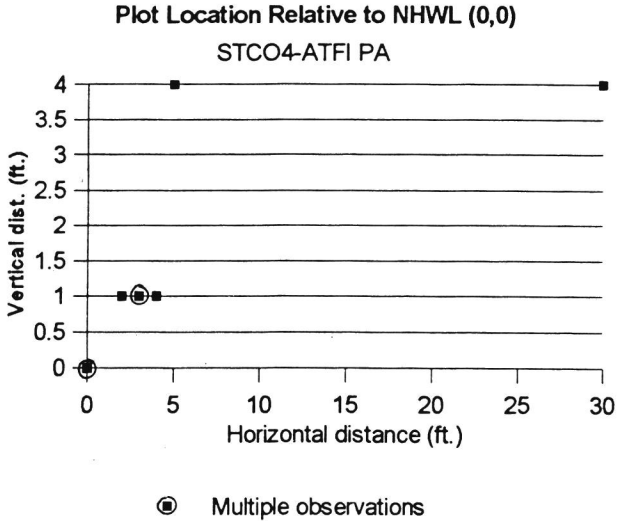
VEGETATION COMPOSITION AND STRUCTURE-- The STCO4-ATFI plant association (PA) is a moderate to dense community of forbs, often with traces of shrubs. Moss cover is low. Cooley's hedgenettle (STCO4) is always present and usually dominant. Ladyfern (ATFI) is usually present as well, and generally co-dominant with Cooley's hedgenettle. Low to moderate amounts of other moist-site herbs may occur, most commonly piggyback plant (TOME) and Siberian miner's lettuce (MOSI). Traces of stinkcurrant (RIBR) and salmonberry (RUSP) may be present. There was an average of 15.3 vascular plant species per plot in this sample, with an average of 6.6 dominant species. These are average values compared to riparian types overall.

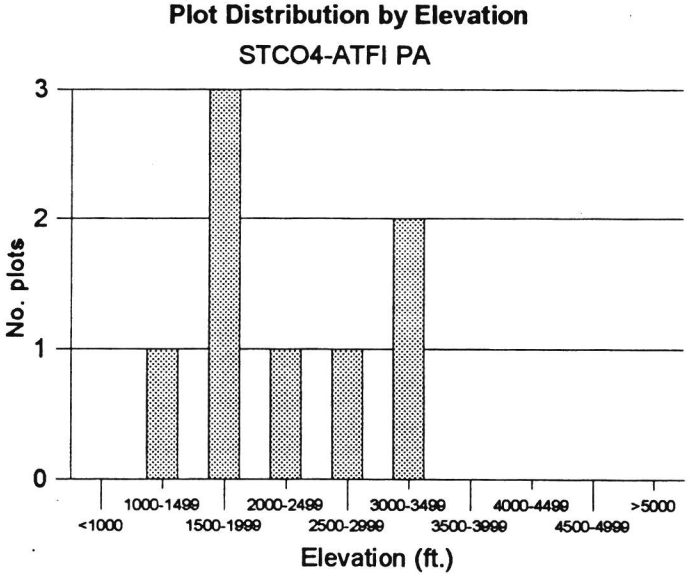
ENVIRONMENT AND DISTRIBUTION -- The STCO4-ATFI PA indicates moist, usually gravelly or rocky sites, not seasonally flooded, with a fairly long growing season. One ecotype, the STCO4-ATFI Alluvium ET, is described from this sample. It occurred on flat to gently-sloping (rarely steep) gravel and cobble deposits (sometimes with a few cm. of sand or silt at the surface) within the floodprone zone

SPECIES	CODE	CONS.	%COV.
Shrubs			
Ribes bracteosum	RIBR	38	1
Rubus spectabilis	RUSP	38	1
Forbs			
Athyrium filix-femina	ATFI	88	7
Galium triflorum	GATR	75	3
Heracleum lanatum	HELA	38	7
Montia sibirica	MOSI	50	2
Petasites frigidus	PEFR2	38	4
Stachys cooleyae	STCO4	100	19
Tolmiea menziesii	TOME	63	8
Viola glabella	VIGL	50	7
Grasses/grasslikes			
Unidentified grasses	GRAMI	50	2
Moss		63	7
Bare soil/sand		75	8
Gravel		50	19
Cobbles		75	30
Rock		75	10

in incised to alluviated channels (Rosgen A, B and C channel types) throughout the study area, mostly at lower to moderate elevations. Our plots in this sample occurred at higher elevations on the east side of the Cascade crest (2700-3300 ft.) than on the west side (1340-2100 ft.). There generally was significant bare gravel, cobbles or rock. The plant species present suggest that the substrate is moist in the rooting zone throughout the growing season. The plots in this sample were within 4 feet above the normal-high water line, and (with one exception) within 5 feet lateral distance. It is likely that these surfaces were created by deposition of larger materials in major floods of the past few decades. The presence of a well-developed vegetative community along with the absence of finer substrate materials suggests that subsequent flooding has been







rare. The STCO4-ATFI PA generally occured as a "streambank fringe" type on upper streambanks and terraces. A similar community has been observed farther south in the Cascades on the Willamette National Forest, but environmental and successional parallels with the STCO4-ATFI PA have not been established.

MANAGEMENT IMPLICATIONS -- Given the hydrologic regime, the STCO4-ATFI PA probably represents the potential vegetation for sites in which it occurs. The coarseness of the substrate (even though moisture is abundant) and the frequency/intensity of flooding appear to prevent encroachment of shrubs and trees.

Lacking a coniferous or shrubby component, the STCO4-ATFI PA does not contribute significantly to stream shading or input of large woody debris. The relatively dense herbaceous vegetation probably does provide

some foliar input to the stream, and protects streambanks from surface erosion of finer sediments. This community promotes recovery from flood events by causing accumulation of organic matter and enhancement of site productivity.

Where there is a significant amount of cobbles and rock, sites with the STCO4-ATFI PA are likely to be difficult to rehabilitate, especially with a herbaceous community. Red alder (ALRU) may be the easiest species to establish. Stinkcurrant (RIBR) and salmonberry (RUSP) would also be appropriate.

WILDLIFE HABITAT RELATIONSHIPS -- The moderate to dense community of forbs in the STCO4-ATFI PA provides some cover for ground nesting birds, small mammals, amphibians and reptiles. The trace amounts of scattered shrubs provide limited cover for a variety of small birds. The occasional salmonberry and stinkcurrant provide small amounts of berries for food for a variety of wildlife. Spaces between cobble and gravel deposits provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians. The STCO4-ATFI is sometimes found near shrubby riparian sites. This edge between the shrub and forb types provides good habitat for wildlife, such as songbirds, rabbits and hares, which forage in the open but require shrub cover for nesting or resting.

These flat riparian areas with moist soils provide cool resting sites for deer and elk during summer heat. Only a small amount of browse is provided by the scattered salmonberry. However, the forb layer provides a moderate quantity and quality of forage species for summer grazing.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The STCO4-ATFI PA is usually associated with riparian types that reflect moist conditions and a relatively long growing season. The most common are the (Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS), Coltsfoot (PEFR2), Western Redcedar/Ladyfern-Cooley's Hedgenettle (THPL/ATFI-STCO4), Cooley's Hedgenettle-Yellow Monkeyflower STCO4-MIGU), and Red Alder/Oxalis (ALRU/OXALIS) types.

UPLAND -- Plant associations indicative of moist, productive environments are most frequently found adjacent to the STCO4-ATFI PA. The most common in this sample were the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) association in the Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986), and the Grand Fir/Vinemaple/Vanillaleaf (ABGR/ACCI/ACTR) and Western Redcedar-Grand Fir/Vanillaleaf (THPL-ABGR/ACTR) associations in the Grand Fir Zone (Topik and others, 1988).

SIMILAR RIPARIAN TYPES IN THIS AREA -- The STCO4-ATFI PA may be confused with the following types, and can be distinguished from them as noted below:

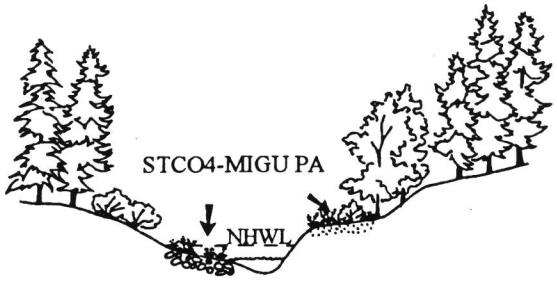
- □ THPL/ATFI-STCO4 PA - has well-developed tree and shrub layers
- □ ALRU/OPHO PC - red alder and devilsclub are dominants; has well-developed tree and shrub layers
- □ ALRU/RUPA PC - thimbleberry is dominant; has well developed tree and shrub layers
- □ ALRU/STCO4 PC - red alder is dominant
- □ ACCI/STCO4 PA - vinemaple is dominant; shrub layer is well-developed
- □ COST PA - red-osier dogwood is dominant; "
- □ OPHO PA - devilsclub is dominant; "

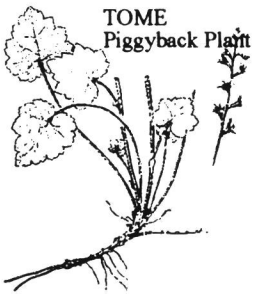
RELATIONSHIP TO OTHER CLASSIFICATIONS -- The STCO4-ATFI PA has not been described elsewhere in the Pacific Northwest.

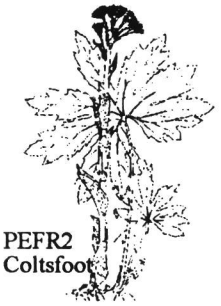
STCO4-MIGU PLANT ASSOCIATION
Stachys cooleyae-Mimulus guttatus
Cooley's Hedgenettle-Yellow Monkeyflower

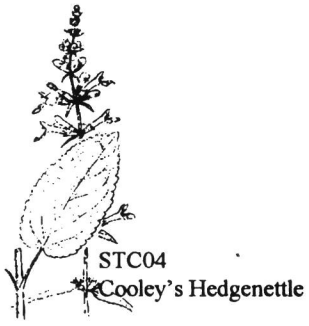
FW4230

No. Plots = 12









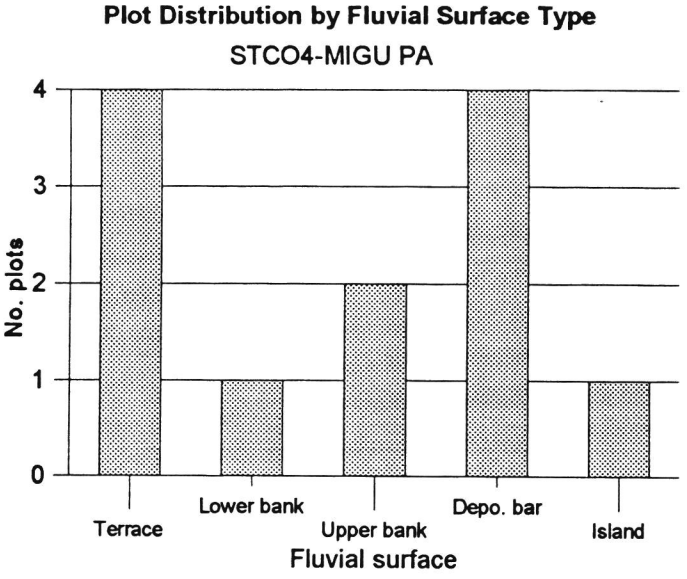
VEGETATION COMPOSITION AND STRUCTURE -- The STCO4-MIGU plant association (PA) is a moderate to dense community of moist- to wet-site forbs and grasses with occasional shrubs in small amounts. Moss cover is variable. With regard to species composition, this community is a somewhat variable mix of species with similar indicator value. Cooley's hedgenettle (STCO4) is nearly always present, usually with at least 10% cover. Yellow monkeyflower (MIGU) is commonly associated, but abundance can be variable. Coltsfoot (PEFR2), sweetscented bedstraw (GATR), tall mannagrass (GLEL) and piggyback plant (TOME) are also frequently found. Scattered salmonberry (RUSP) or ninebark (PHCA3) may be present. There was an average of 13.5 vascular plant species in this sample of the STCO4-MIGU PA, with 5.6 dominant species. This represents rather low overall values compared to riparian types overall.

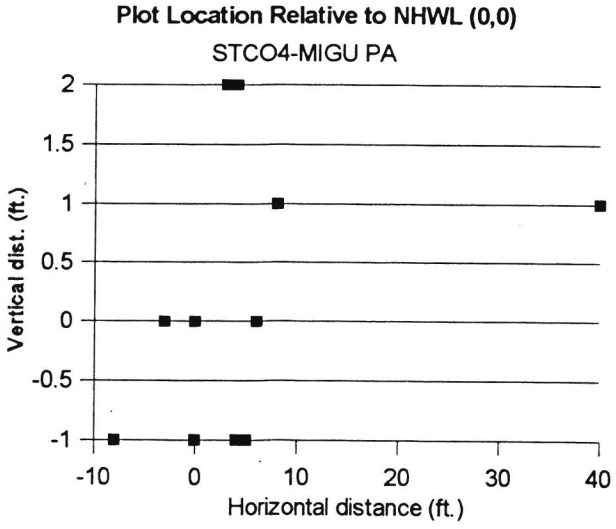
ENVIRONMENT AND DISTRIBUTION -- The STCO4-MIGU PA represents wet sites and is found throughout the study area at low to moderate elevations. Two ecotypes are described for this

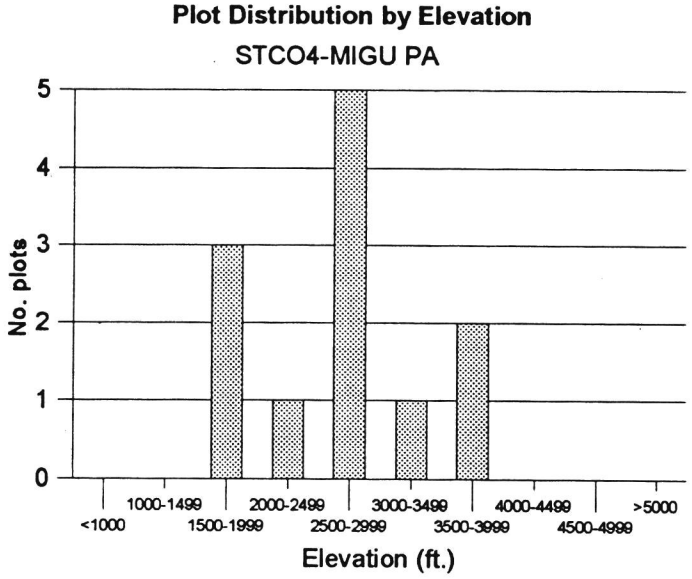
SPECIES	CODE	CONS.	%COV.
Shrubs			
Rubus spectabilis	RUSP	36	2
Forbs			
Athyrium filix-femina	ATFI	36	2
Equisetum arvense	EQAR	36	8
Galium triflorum	GATR	45	4
Mimulus guttatus	MIGU	73	8
Montia sibirica	MOSI	36	2
Petasites frigidus	PEFR2	45	3
Stachys cooleyae	STCO4	91	24
Tolmiea menziesii	TOME	45	5
Grasses/grasslikes			
Glyceria elata	GLEL	45	11
Unidentified grasses	GRAMI	36	7
Moss		83	20
Bare soil/sand		83	20
Gravel		42	8
Cobbles		50	21
Rock		42	24

sample. The STCO4-MIGU Cobble ET occurred on flat lower streambanks and depositional bars within the bankfull zone, usually in alluviated mountain valleys (Rosgen C channel type), rarely in steep, incised channels (Rosgen A channel type). The substrate consisted of cobbles or gravels, sometimes with a thin layer (5 cm.) of sand at the surface, and appeared to remain wet throughout the growing season. Sites with this ecotype commonly had at least 30% bare sand or rock. Inundation probably occurs seasonally, and shallow, gently-flowing water is often present even during the growing season.

The STCO4-MIGU Terrace ET was found on low terraces or islands at varying distances from the stream edge. The substrate was finer-textured than described above, and generally consisted of deposits







of silts and sands. Soils appeared wet year-round. This ecotype was much more likely to have scattered shrubs than the STCO4-MIGU Cobble ET.

MANAGEMENT IMPLICATIONS -- Both ecotypes described above probably represent the potential vegetation for the landforms on which they occur. Soils are likely to be too wet, rocky or frequently flooded to support significant woody vegetation.

Lacking tree and shrub components, the STCO4-MIGU PA does not contribute significantly to stream shading, input of large wood or bank stabilization. Within the bankfull zone, the vegetation may help to decrease flow velocity and aid in deposition of fine sediments and organic debris, and also contributes a small amount of foliar material. Sites with this plant association that are below the normal high-water line may require considerable recovery time and be difficult to revegetate if disturbed. Above the normal

high-water line, wet soils may challenge efforts at site rehabilitation. If a shrub component is desired, the best choices are probably salmonberry, stinkcurrant (RIBR) and ninebark.

WILDLIFE HABITAT RELATIONSHIPS -- The moderate to dense community of forbs in the STCO4-MIGU PA provides cover for ground nesting birds, small mammals, amphibians and reptiles. The trace amounts of scattered shrubs provide limited cover for a variety of small birds. Scattered salmonberry may provide small amounts of berries for a variety of wildlife. Spaces between cobble and/or gravels provide habitat for invertebrates consumed by insectivorous wildlife such as sandpipers, shrews, garter snakes, and amphibians.

The STCO4-MIGU PA is often found near shrubby riparian sites. This edge between the shrub and forb types provides good habitat for wildlife that forage in the open but require shrub cover for nesting or resting.

These flat riparian areas with moist soils provide cool resting sites for deer and elk during summer heat. Only a small amount of browse is provided by the scattered salmonberry. However, the forb layer provides a moderate quantity and quality of forage species for summer grazing. The topography and lower elevation of these sites would suggest wintering areas for deer and elk. However, winter browse is limited. Additional browse may be available in adjacent shrubby types.

Where these sites occur on depositional bars or islands they would provide resting sites for waterfowl that offer some protection from mammalian predators. The forbs and grasses would provide some hiding cover.

ASSOCIATED VEGETATION COMMUNITIES

RIPARIAN -- The STCO4-MIGU PA in this sample occurred adjacent to a large number of other riparian types. The most common was the Stinkcurrant-Salmonberry/Oxalis (RIBR-RUSP/OXALIS) type, followed by the Coltsfoot (PEFR2), Red-Osier Dogwood (COST), Alaska Huckleberry-Ovalleaf Huckleberry (VAAL-VAOV), Cooley's Hedgenettle-Ladyfern (STCO4-ATFI), Common Horsetail (EQAR), Red Alder/Salmonberry/Piggyback Plant (ALRU/RUSP/TOME), Red Alder/Thimbleberry (ALRU/RUPA) and Red Alder/Oxalis (ALRU/OXALIS) types.

UPLAND -- The STCO4-MIGU PA most commonly occurred adjacent to moist, productive Western Hemlock Zone (Halverson and others, 1986; Topik and others, 1986) and Pacific Silver Fir Zone (Hemstrom and others, 1982; Brockway and others, 1983) associations. The types most frequently encountered in this sample were the Western Hemlock/Swordfern-Oxalis (TSHE/POMU-OXOR) and Pacific Silver Fir/Alaska Huckleberry/Bunchberry Dogwood (ABAM/VAAL/COCA) associations.

SIMILAR RIPARIAN TYPES IN THIS AREA -- The STCO4-MIGU PA may be confused with the following types, and can be distinguished from them as noted below:

- EQAR PA - has only small amounts of Cooley's hedgenettle
- MIGU PA - generally lacks Cooley's hedgenettle; more often in running water or the splash zone

RELATIONSHIP TO OTHER CLASSIFICATIONS -- The STCO4-MIGU PA has not been described elsewhere in the Pacific Northwest.

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APPENDIX A

ECOLOGY PLOT DATA LIST

AREA 7 ECOLOGY PROGRAM

STREAMSIDE PLOT INSTRUCTIONS
Revised 6/17/90

OBJECTIVES

The purpose of gathering streamside plot data in this project is to produce a classification of streamside vegetative/geomorphic features. The sampling design is such that plant communities are juxtaposed on their geomorphic surfaces and then related to the stream channel itself. Because this project is being carried out in coordination with the Riparian Inventory, we will later be able to relate our riparian information to the aquatic data being collected by the fisheries/hydrology programs.

Once the classification is completed, it will be used in inventories of stream systems, to help understand the dynamics of such systems and how they respond to perturbations, and to help establish reasonable and meaningful objectives for managing riparian areas.

The classification will be hierarchical, with plant community/geomorphic feature clusters, or complexes, probably being the most commonly-used level.

COORDINATION WITH RIPARIAN INVENTORY

Because of the desirability of tying riparian and aquatic information together, it was decided to conduct the two data collection efforts together, although they have slightly different objectives, inventory vs. classification. Ecology Program employees will be placed with stream survey crews, and may often work as one unit.

Ecology information will be collected at every "nth" habitat feature type (unit), using the stream survey's system of determination. The upper and lower ends of the nth habitat feature will be flagged and labeled with the natural sequence and habitat feature numbers, usually by the stream surveyors since they will generally work somewhat in advance of the ecology person.

SAMPLING PHILOSOPHY

The objective of sampling in this project is to describe the major communities, their geomorphic surfaces and relation to disturbance factors. But even with such a simplistic, non-quantative goal, there are major problems to overcome.

The primary difficulty arises from the extreme patchiness found in riparian systems, and the fact that the grain size of patches varies widely from place to place. We attempted many different ways of characterizing this patchiness before arriving at the procedures outlined below.

The two ways we have chosen to address this problem are: use of subjective sampling without preconceived bias, and treating the vegetation as a mosaic. Subjectively locating variable-sized plots within stream segments selected in an unbiased manner (nth units determined by stream survey crews) allows us to use obvious community boundaries as a guide in plot establishment, and to adjust plot size to fit the particular site. It bears emphasis that using the nth (measurement) units as sampling sites does not presume we hypothesize a link between habitat features (pools, riffles, glides) and riparian vegetation/geomorphology. Such a link between vegetation and stream morphology /

probably occurs at a much larger scale, and is related to hillslope/stream interactions. It is simply a matter of convenience to 1) have an unbiased way of determining where to sample and 2) to tie the Ecology and Riparian Inventory databases together in a concrete fashion.

Treating the vegetation as a mosaic means we sample individual patches for composition, but are also interested in juxtaposition of patches - which types are commonly found together, on which kinds of geomorphic surfaces. At the operational level, vegetation will more likely be described as a mosaic of communities, then, rather than numerous individual communities of small areal extent.

PLOT ESTABLISHMENT

Plots will be established within each nth habitat feature, located to represent the major combinations of plant community/geomorphic surface. A maximum of 5 plots per habitat feature will be established, unless there is extra time or some other reason to do more. The plots will represent communities between the stream edge and the adjacent upland plant association. If the upland plant association comes all the way down to the water line, no plots will be taken. In this case you would fill out only the Habitat feature summary cards (cards 1-3) which include general ecological information of the site. There is no need to permanently mark plots for relocation.

Because of the wide variation in patch sizes of riparian communities, we will be forced to use variable plot sizes. Statistically, this is not an optimum approach, but there seems to be no better way to get the data. Remember, the objective is to adequately characterize the patterns of dominant species, and to end up with a species list that includes all of the dominants and most (80%) of the incidental species.

In very irregular, long/narrow or small communities, with or without trees, the boundaries of the plot will correspond roughly to the community type itself. In treeless types where there is room, a 5x10m plot can be used ($500m^2$) (16.25'x32.5'). In forested with room, use a circular $500m^2$ plot (42' radius). Denote the plot dimensions in the space provided on Card 4. Changing plot sizes will make estimating percent cover challenging, so take time to make careful estimates.

* On a $500m^2$ plot: 1% - an area of approximately 7'x7'
* On a 5x10m plot: 1% - an area of 1m x 0.5m
* Pie chart tatum aid may also be quite helpful in cover estimation

DATA COLLECTION

Fill out one Habitat Feature Summary (Cards 1-3) plus as many Plot Forms (Cards 4 through 7) as there are plots.

Card 1&2 - Habitat Feature Summary

This is information that will be collected for the Nth habitat feature as a whole. Collect the data for the midpoint (approximate) of the habitat feature, or some representative point if the midpoint is atypical.

STREAM: Record the name of the stream.

REACH #: Record the reach# from the stream survey.

DATE: Record the date, including the year.

NATURAL SEQUENCE NO. and HABITAT TYPE/NUMBER: Record from the stream survey (should be on the flags at the head and foot of the habitat feature).

FOREST: 03 - Gifford Pinchot, 06 - Mt. Hood

DISTRICT:

Gifford Pinchot
1 - MSHNVM
3 - Mt. Adams
4 - Packwood
5 - Randle
8 - Wind River

Mt. Hood
1 - Barlow
2 - Bear Springs
3 - Clackamas
4 - Columbia Gorge
5 - Estacada
6 - Hood River
9 - Zigzag

TWP, RNGE, SEC: Record township, range and section. Townships north are followed by a N, townships south by a S. All ranges are east.

OBSERVERS: Record observers' last names, include stream surveyors if known

OF PLOTS: Record total number of plots sampled within this habitat feature. Enter "0" if none were done.

AIRPHOTO: If the plot can be located on an airphoto, record the photo # and year of photo.

VALLEY SEGMENT TYPE: Record the valley segment code from the attached list that best describes the site you are in. Stream survey crews (on GP) may also be recording this information so it would be wise to compare answers. The purpose for recording valley segment type is to provide information about the substrate, amount and nature of constraint, side slope steepness and channel pattern, so it can be correlated with vegetation.

NORMAL HIGH WATER LINE WIDTH: Estimate the width of the normal high water line, in feet (SEE ATTACHED DEFINITIONS & DIAGRAM).

ACTIVE CHANNEL WIDTH: Estimate the width of the active channel (extreme high water line), in feet (SEE ATTACHED DEFINITIONS & DIAGRAM)

STREAM GRADIENT: Measure the gradient of the stream within the habitat feature, in percent.

STREAM ASPECT: Record the direction in which the stream flows within the habitat feature, in degrees of azimuth.

ELEVATION: Record the elevation of the habitat feature, in feet above sea level. Use a topographic map.

UPLAND PLANT ASSOCIATIONS: Record the alpha codes (using PNW-46 coding, found in the Plant Association Guides) of the adjacent upland plant associations, for both right and left banks if possible.

FOLIAR INPUT TO STREAMS: (Card 2) Record the predominant species that overhang, or provide foliar input to the stream. Use alpha codes from PNW-46. Then estimate and record the percent each species represents of the TOTAL OVERHANGING VEGETATION. This is not the same as estimating percent cover on plots!! This is the only instance in our data collection where the percentages should add up to 100%.

Also, estimate the percent of the stream surface in the habitat feature that has overhanging vegetation of some type (this IS analogous to the usual way we do percent cover), and record in the space provided for "% OVERHANGING VEGETATION".

Card 3 - Drawings and Comments

X-SEC and PLAN VIEWS: Make cross sectional and plan view sketches of the habitat feature and associated riparian zone, including the major geomorphic surfaces, plant communities and any significant in-stream features (debris jams, waterfalls, chutes, etc.), and plot locations. They do not need to be to scale or highly artistic. Include direction of stream flow. The purpose is to show the juxtaposition of the types with respect to the stream, each other, and plot location.

COMMENTS: Anything that you think should be recorded about the site that is not provided for on the plot card should be commented on in this section. If a site is disturbed an any way, please use this space to comment on the type and intensity of disturbance, as well as what you think the effect has been on the vegetation or ground. Also, if this is a habitat feature where an upland plant association comes all the way to the water's edge, and thus there are no plots taken, please note this fact in the "Comments" section.

Taking Plot Photographs - For each plot sampled, take two colored slide shots of the plot. The first shot should be a wide angle view of the whole plot. The following photo(s) will focus closer toward the vegetation on the plot thus it is important to have these photos follow the overal plot shot. Horizontally framed photos are preferred. When slides are developed, label each slide with plot #, stream name and put in slide binders by Forest.

Card 4 - Plot Form A

STREAM, REACH #, NATURAL SEQUENCE NO. and HABITAT TYPE/NO.: Repeat from Card 1.

PLOT: Record the 4-digit plot number for the plot. Gifford Pinchot plots will start with 5000, Mt. Hood plots with 9000. Blocks of plots will be assigned to crews at the start of the field season.

PLOT DIMENSIONS: Record plot size used.

PHOTOS: Record the roll and photo numbers of any photographs you have taken of this plot.

GEOSURF: Record the code for the dominant geomorphic/fluvial surface of the plot, as well as a secondary. For example a depositional bar of gravel located inside a sharp bend may be coded as 8/10. See the attached list of codes.

SLOPE: Using a clinometer, record the percent slope of the plot.

ASPECT: Record the aspect of the plot in degrees of azimuth.

RELEV: Estimate and record the elevation of the plot ABOVE THE STREAM (normal high water line) in feet (not above sea level). NOTE: A plot on a lower bank is by definition BELOW the normal high water line thus should have a negative value, or at most, a zero entry.

DIST: Estimate and record the distance from the plot center to the normal high water line of the stream or closest side channel of water influence, in feet. NOTE: As with 'Relev' if the plot is on a geosurf type such as a lower bank that is seasonally below the high water line, reflect this by recording a zero, or negative value. In the case of an Island, if the island is not seasonally submerged than simply put the positive distance from plot center to normal high water line.

SOIL LAYERS: For the top 7 discernible layers of soil, or to a depth of 1 m., whichever is least, record the depth in cm., texture and color (list of codes attached). In addition, estimate the thickness of the Litter (L), Fermentation (F) and Humus (H) surface organic (duff) layers and record in cm.

H2ODEP: Estimate and record the depth to free water (water table) in cm. at the plot (up to 1 m.).

MOTTLES: If mottles are present AND ARE NOT RECORDED IN THE SOIL LAYERS (in the event that there are 7 or more soil layers above them), record the depth, in cm.

VEG. LAYERS: Record the number of distinct vegetative "layers" of the plot. For example, a stand of alder over a sward of coltsfoot and ladyfern = 2 layers. In extremely brushy sites, the vegetation might not actually be layered, even though there may be several life forms present. In that case, record 1 layer.

CANOPY HT: Estimate the height of the main canopy, and record in feet. Include entries for treeless plots as well (ex: height of main shrub layer)

TREEM through BEDROCK: Estimate and record the percent cover of each of the following phenomena:

- TREEM - mature trees (12+' tall)
- TREER - reprod trees (<12' tall)
- SHRUB-H - tall shrubs (1m+ tall)
- SHRUB-L - low shrubs (<1m tall)
- FORB - forbs
- GRAMINOIDS - grasses and grasslikes
- MOSS - bryophytes
- BARE - bare soil (no litter)
- GRAVEL - rock fragments 2mm-3"
- COBBLES - rock >3"
- BROCK - rock covered by litter and/or moss
- BEDROCK - bare bedrock

Card 5 - Plot Form B

MATURE TREES, REPROD TREES and SHRUBS: For each of these life forms, record the alpha code (from PNW-46) and estimated percent cover. Mature trees are those 12' and taller, reprod trees are those <12'. Estimate to the nearest 1% for values between 1 and 5%, to the nearest 5% for values between 5 and 30% and to the nearest 10% above that. Record "+" for less than 1% cover.

Card 6 - Plot Form C.

FORBS, GRAMINOIDS and CRYPTOGAMS: For each of these life forms, record the alpha code (from PNW-46) and estimated percent cover, as above. Identifying cryptogams to genus and species has lesser priority for this project, but should be recorded if known or easily identified.

Collection of Specimens: USE PLOT NUMBER AND SUFFIX AS COLLECTION NUMBER, NOTE ON PLOT CARD WHAT SPECIMENS WERE COLLECTED. LABEL CLEARLY.

When collecting plant material for verification, identification, or as voucher samples it is important to clearly label the plot card in the space provided to indicate the plant is collected. Add a suffix number to the plot number for each specimen collected on that plot to obtain a unique collection number (EXAMPLE: three plants collected from plot 8727, should be labeled 8727-1, 8727-2, and 8727-3). Material collected MUST be labeled immediately with the specific plot number/collection number it was collected from, in addition write this info on newspaper when plant is pressed.

If the same plant in question was already collected on another plot indicate in the space what plot it was collected on, preferably by its unique collection number, 8727-2, etc. When plants similar in appearance are collected from the same plot, its often helpful to cross reference material with the same verbal description or letter code used on the plot card (Example: #8675-1 hairy salix, #8675-2 smooth salix).

When collecting shrubs, be sure to note height of the plant. With willows, if you can't find any fruits on the plant, look around on the ground to find fruits. Willows are nearly impossible to identify without fruits, so attempt to get fruits for all specimens.

When collecting sedges and grasses, be sure to get enough roots to determine if it is rhizomatous or not. Note whether the plants are growing singly or in clumps.

EXAMPLE from plot # "309"

PLOT #309

FORBS spp.	%cov = 0	Collected?
CAPA3 - 10	Castilleja parviflora	300-3
ERPE - 12	Erigeron peregrinus	307-1
ASAL - 2	Aster alpigenus	3
POBI - 1	Polygonum bistortoides	
HIGR - +	Hieracium gracile	
LIGR - 2	Ligusticum grayi	300-1
PEFL2 - 1	Potentilla flabelliflia	300-2
ARCAZ +	Arenaria capillaris	300-4
CASU6 - +	Cirsium subalpinus	
XETE - +	Xerophyllum tenax	
EPAL - 1	Epilobium alpinum (rhizomatous) per.	4
LULA2 - 2	Lupinus latifolius	
GRASSES/GRASSLIKES = 0		
JUDR - 2	Juncus drummondii	1
CANI2 - 8	Carex ~~capitata~~ nigricans	2
CALA4 - 10	Calamagrostis sp.	5

Card 7 - Plot Form D

TREE STAND MEASUREMENTS - Tree and stand measurements will be recorded on plots with trees, and on plots adjacent to tree-dominated communities.

SERAL - Record the seral stage of the stand from the following list:

1 - Very early, pioneer (1-30 years), brush and small trees
2 - Early (30-100 yrs), young stand
3 - Mid-seral (100-200 yrs), mature stand
4 - Late (200+), old, but early seral spp still present
5 - Climax, old, early seral species absent

STRUCT - Record the stand structure code that best fits the stand. For stands with a supercanopy over a subcanopy, (i.e., 2 VERY distinct age classes) record as a complex (i.e., 4/2) with the highest layer first.

1 - Open sapling-pole, ≤11" dbh, open canopy
2 - Close sapling-pole, ≤11" dbh, closed canopy
3 - Small sawtimber (11-20.9" dbh)
4 - Large sawtimber (≥21" dbh)
5 - Old growth

LIVE TREE TALLY - Live trees will be tallied using a wedge prism at plot center Pick a prism that will give you at least 5-8 "in" trees. Always record the BAF# used in space at top of this section! Record each "in" tree (all DBH's) by species and DBH to the nearest inch. Appendices A and B contain instructions for the use of the wedge prism and for checking borderline trees.

After completing the tally, summarize basal area by species in the spaces provided. Basal area = (BAF factor) x (# of trees).
EXAMPLE: If BAF=20, and you count 6 "in" trees then Basal area = 20 x 6 = 120.

SNAG TALLY - As for live trees, a wedge prism will be used at plot center to tally all snags (dead trees) >10' tall, any diameter. For each "in" snag, record species, diameter class, height class and condition. Codes for the latter 3 attributes are found in the Tatum Aids Attachment. Recommend using a 10 BAF in most all cases (or one that will yield 5-8 "in" snags) and again, be sure to record this number in appropriate space!

NOTE: WE WON'T BE COLLECTING SITE TREE INFO WITH THE INTERN CREWS OF 1991, IN LIEU OF THIS WE WILL SAMPLE AGES ONLY OF TREES ON TREE PLOTS AS AN AID FOR DETERMINING AGE OF A FLUVIAL SURFACE.

Drill a few representative examples of the older trees on the plot to determine age at DBH (Diameter at breast height = 4 1/2')

THIS DATA COLLECTED ONLY IN 1991

SITE TREES: (Intern crews won't collect following in 1991)
In sites with mature trees, site trees should be measured. Site trees are intended to provide best-case productivity estimates for plot locations. Choose up to 3 trees per major species as site index trees. Use the largest dominants or codominants in the stand as site trees. Choose trees that are free from observable defect, conks, forked tops, mistletoe, crooks, sweep, etc. For each site tree, record the species code, height (see attachment for best method for measuring tree height), age, dbh, live and dead basal area (measured with a prism with the site tree as plot center), and current radial increment (1/20 inches).

SPP: Site tree species code
HT: Total height in feet of site tree.
AGE: Age of tree in years measured at breast height with increment bore.
DBH: Diameter in inches (to nearest 1/10 inch) at breast height (4.5' above ground on high side of tree).

LBA: Live Basal Area around site tree. Use the site tree as plot center. Choose a prism that will give you at least 5-8 "in" trees. Appendices A and B contain instructions for the use of the wedge prism and for checking borderline trees. Compute basal area as follows and enter in blank.
BASAL AREA = (BAF factor) x (# of 'in' trees).
EXAMPLE: If BAF=20, and you count 6 "in" trees then Basal area = 20 x 6 = 120.

DBA: Dead Basal Area. Follow above procedure to measure snags around site tree. A snag is a dead tree at least 10' tall. Generally you will need to use a smaller BAF prism then for live trees to get a better sample.

CG: Current Growth meassured in 1/20th's of an inch (compass edge) of the last 10 full years of growth (from core taken at breast height).

SI: Leave blank. This will be calculated later in the office.
GBA: Leave blank. This will be calculated later in the office.

ON PLOT(#): If this particular site tree is located on a plot that was sampled, OR is rooted in the same community as the plot, fill in that plot number here... otherwise leave blank.

ADJ. PLOT: If this particular site tree is not actually in the same community as the plot, but is nearby, note plot number(s) it is adjacent to

THIS DATA COLLECTED ONLY IN 1990

SAMPLES OF TREE DATA CARDS USED IN 1990 & 1991

1990 TREE DATA COLLECTED

AREA 7 ECOLOGY PROGRAM
STREAMSIDE DATA
PLOT FORM D

CARD 7

REACH # 2

HABITAT TYPE/# R20

AM N.F Clackamas

JRAL SEQ. # 27

T 9027

E/STAND MEASUREMENTS:

ERAL 3 STRUCT 4

TE TREE DATA:

	TREE 1	TREE 2	TREE 3	TREE 4	TREE 5
ECIES	TSHE	TSHE			
(ft)	170	120			
E	96	110			
H (0.1")	28.3	32.0			
BA	120	60			
BA	20	40			
G (1/20")	10	12			
I					
BA					
N PLOT(#)					
DJ. PLOT	X	X			

1991 TREE DATA COLLECTED

1991

CARD D ~~1987~~

REE, SNAG, ~~AND DOWN WOOD~~ MEASUREMENTS** SERAL 2 STRUCT 3/1 ** Forested ~~Wetlands~~ Only**

~~WETLAND~~ # _____ PLOT # 9365

LIVE TREE TALLY:

BAF = 20

Species	DBH
THPL	2
THPL	12
PSME	26
PSME	41
ABGR	30
THPL	11
THPL	11

TOTAL BA/SPP

Species	BA
THPL	80
PSME	40
ABGR	20
	140

SITE INDEX TREE MEASURMENTS

Species	Ht.	Age(BH)	DBH	1/10 BK	1/20 CG
THPL		40			
THPL		46			

CG=Current Grwth, last 10 yrs; CR=Crown Ratio

SNAG TALLY BAF = 10 (≥ 10' tall, any dbh

Species	DBH	Ht.Cl.	Cond.	CAVITIES: New	Old	Re
PSME	22	1	3			
PSME	31	3	2			
PIPO	29	3	1			

DOWN LOGS: (≥ 3" diameter at pt. of intersec

Diam.	Cond.	Size	Length (ft)

GEOMORPHIC/FLUVIAL SURFACE CODES

1 Inactive channel
2 Lower terrace
3 Upper terrace
4 Cutbank
5 Rock cliff
6 Lower bank
7 Upper bank
8 Depositional bar
9 Island
10 Inside bend
11 Outside bend
12 Beaver pond
13 Area of subsurface flow

SOIL LAYER CODES

Organic Layers:

L: Litter layer -
F: Fermentation layer -
H: Humus layer -

Textures:

Cb Cobbles; rock >3"
Gr Gravel; rock 2mm - 3"
S Sand; gritty ; <2mm
Si Silt; soft, flour-like feel
C Clay; sticky, plastic
Va Volcanic ash; cement-like, non-sticky, non-plastic
Vp Volcanic pumice; white-gray "BBs"
P Peat (organic matter, plant parts visible)
M Muck (decomposed organic matter)

Colors:

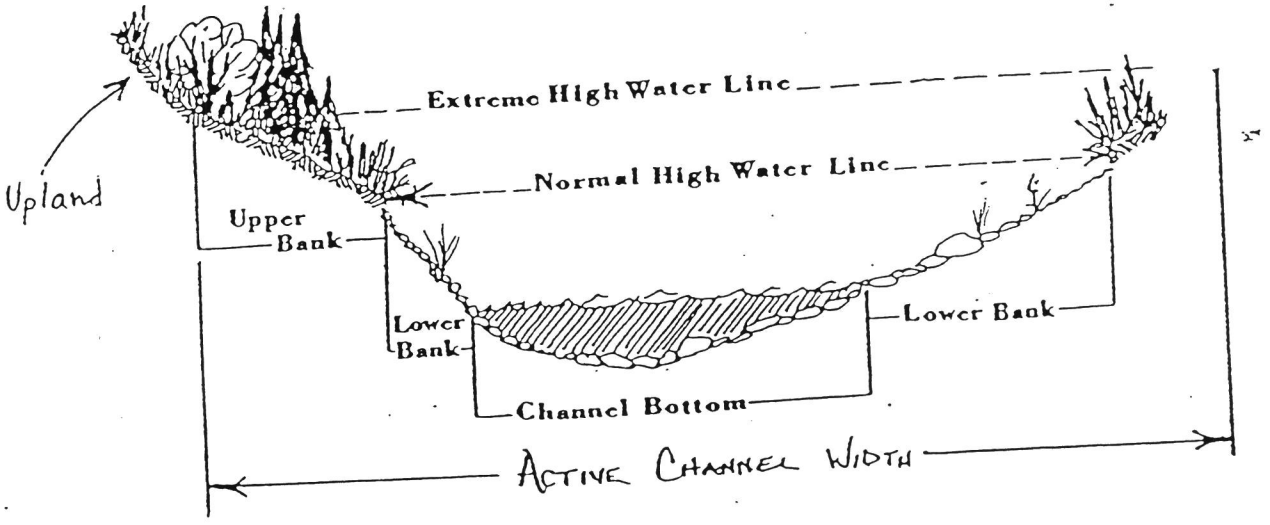
Bl Black
Br Brown
R Red
Y Yellow
G Gray
M Mottled (splotches)
RBR etc. Combinations (ie, reddish-brown)

DEFINITION OF TERMS AND ILLUSTRATIONS

Upper Bank - That portion of the topographic cross section from the break in the general slope of the surrounding land to the normal high water line. Terrestrial plants and animals normally inhabit this area.

Lower Banks - The intermittently submerged portion of the channel cross section from the normal high water line to the water's edge during the summer low flow period.

Channel Bottom - The submerged portion of the channel cross section which is totally an aquatic environment.



ACTIVE CHANNEL WIDTH (ACW) - A place not confined by valley walls where the stream could potentially flow (or has) during extreme high water events. - not yearly → decades to centuries!

NORMAL HIGH WATER LINE - Highest point of water line during annual high water/peak flow events.

APPENDIX B Valley segment classes defined on the Gifford Pinchot N.F.

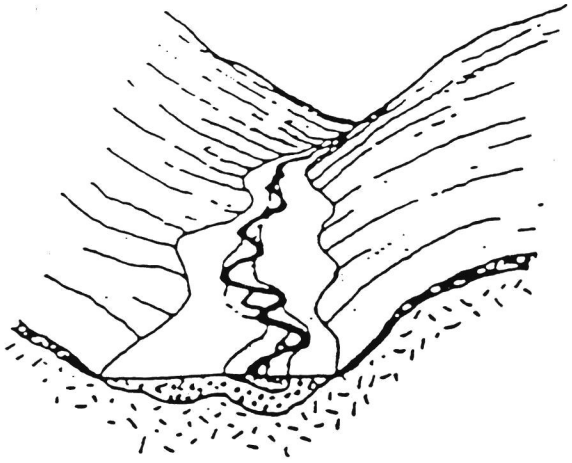
Code	Segment Type	Distinguishing Criteria
	Key	Stream Order: defined by Strahler (1957)
		Valley bottom width: ACW (Active Channnel Width) ~~refers to annual floodplain channel width~~
	Oblique drawing	Side Slopes: gradient of stream adjacent slope and valley wall slopes.
		Channel pattern: degree of sinuosity, meandering and braiding.
		Land Form Feature: describes geomorphic characteristics responsible for segment development.
		Other common characteristics
		Substrate: qualitative description of dominant substrate types.
	Topographic map	Channel gradient: average gradient of overall segment
		Channel Type: material that controls channel pattern: alluvial stream is able to move laterally on valley bottoms: bedrock controlled stream is constricted: boulder controlled stream is controlled by a unconsolidated soil and boulder mixture.
		LWD: Large Woody Debris - describes characteristics in a natural state

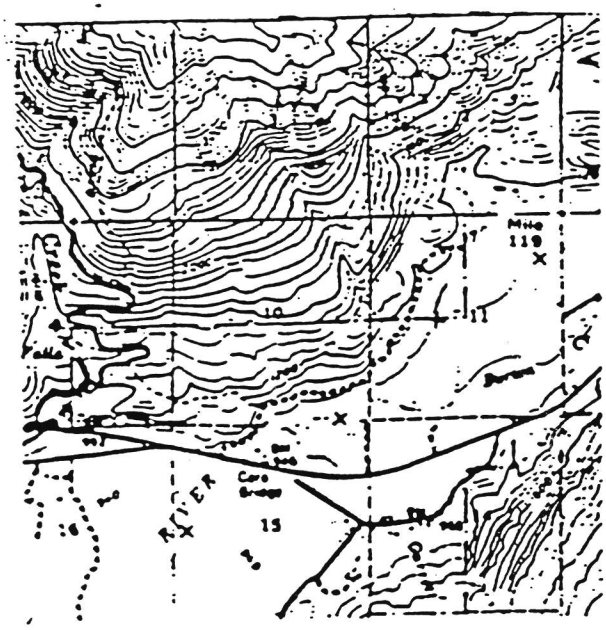
We'll use below Def.

ACTIVE CHANNEL WIDTH (ACW) ≈ VALLEY BOTTOM WIDTH

→ A place not confined by valley walls where the stream could potentially flow (or has) during extreme high water events. (not yearly; time frame could be decades to centuries)

Code	Segment Type	Distinguishing Criteria
1	Lower alluviated valley	Stream Order: Valley formed by major 5th and 6th order streams, but tributaries may be 1-4th order streams flowing through the valley formed by larger stream. Valley bottom width: Greater than 5X ~~new~~ normal high water bkf Side Slopes: 0 - 10% Channel pattern: Often highly meandered Land Form Feature: streams located in lower large river floodplains and on ancient river or lacusterine terraces: streams may be adjacent to moderate to steep slpoes on one side; stream may also be located in low elevation glacier carved valleys that have since been overlain with deep alluvial deposits.





Other common characteristics

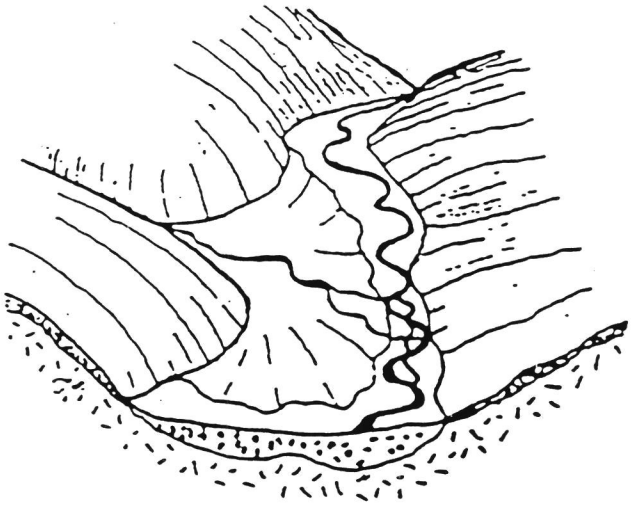
Substrate: fines, gravel, cobble in small 1st and 2nd order tributaries on valley floor; rubble and boulder dominate riffles and rapids of larger rivers.

Channel gradient: 0 - 5%

Channel Type: Alluvial

LWD: Abundant large jams on channel margins and braids in large rivers; variable in smaller 1st through 3rd order tributaries on valley floor; small jams and undercut root wads commonly create good pool and cover habitat in smaller tributaries.

Code	Segment Type	Distinguishing Criteria
2	Alluvial fan	



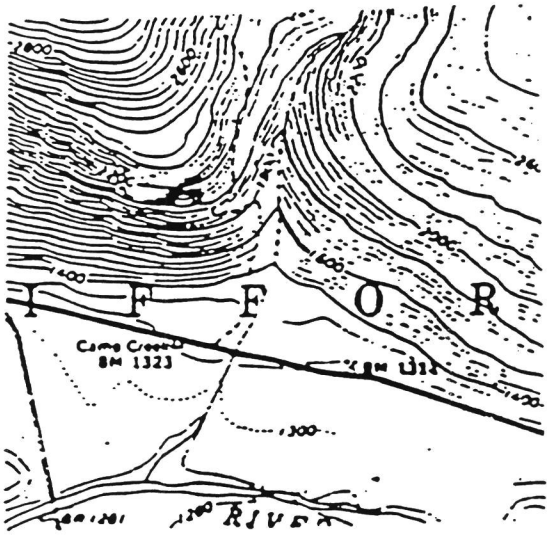
Stream Order: Alluvail fan from large 2nd, 3rd and 4th order tributaries deposited on valley floor and alluvial terraces of 5th and 6th order stream.

Valley bottom width: Greater than 3X normal high water ~~bankfull~~ but may be more confined in upper portions of the fan where the stream exits the canyon.

Side Slopes: flat to moderate, although the upper end of the alluvial deposition may be in lower incised valley.

Channel pattern: moderate sinuous meanders, occasional braids.

Land Form Feature: stream travels through its' own alluvial fan deposition on large 5th and 6th order valley floors; the upper end of these segments may be located in the lower stretches of incised valleys and canyons; stream actively downcuts through unconsolidated banks in moderate gradients.



Other common characteristics

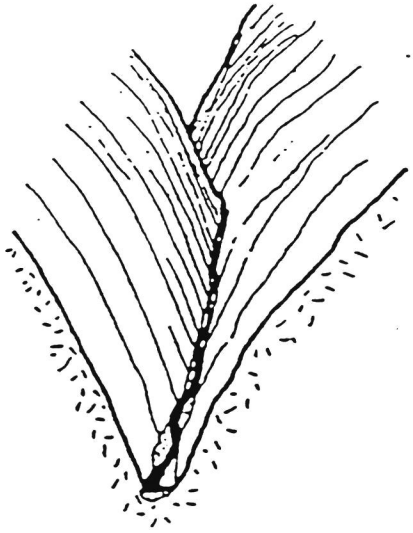
Substrate: boulder, big boulder deposited in upper fan, while smaller rubble and cobble substrate predominate in lower low gradient sections.

Channel gradient: 1 - 6%

Channel Type: Alluvial

LWD: Frequent large jams and individual stems often deposited in high flow channel, but only occasional small jams and embedded individual stems create high quality pools and spawning sites.

Code	Segment Type	Distinguishing Criteria
3	Steeply incised valley/ moderate channel gradient	Stream Order: large 2, 3, 4



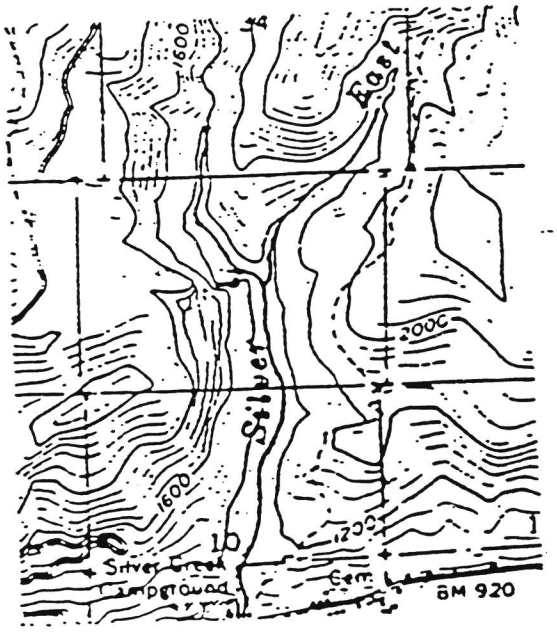
Valley bottom width: 1-2X ~~ACW~~ Normal high water

Side Slopes: steep, often bedrock walled

Channel pattern: straight to slightly sinuous, confined by sideslopes

Land Form Feature: normally found down cutting steep, competent hillsides composed of igneous intrusions or volcanic originated rock; sometimes found in early glacial till and colluvium deposits where stream deeply downcut to a more resistent layer; lava flows or other resistent rock layers may result in vertical canyon walls on one or both sides of the channel.

Other common characteristics



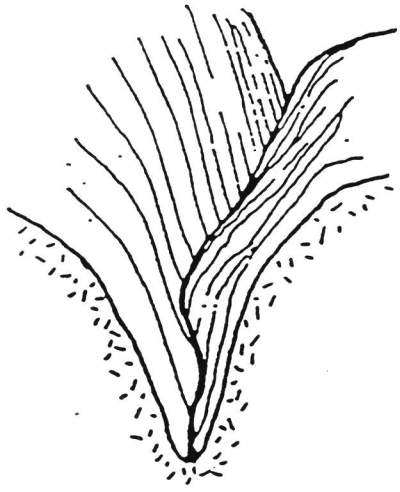
Substrate: boulder, big boulder, bedrock in steeper gradients; rubble, boulder, big boulder in moderate gradients; rubble and cobble in alluviated terraces dammed by debris jams or bedrock constrictions.

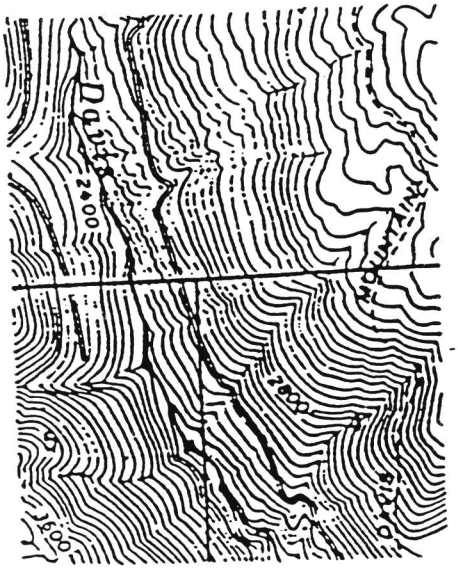
Channel gradient: 3 - 6%

Channel Type: Bedrock control, alluvial in short reaches

LWD: Infrequent large jams; most individual pieces are moved out in flood events; where wood does remain it is normally well mixed and embedded short pieces.

Code	Segment Type	Distinguishing Criteria
4	Steeply incised valley/ steep channel gradient	Stream Order: 2, 3,; large 3rd and 4th order streams usually downcut to the extent that they create segment code 3 type channels. Valley bottom width: 1X ~~ACW~~ Normal high water Side Slopes: steep, commonly vertical cliffs Channel pattern: straight to slightly sinuous, confined by sideslopes Land Form Feature: normally found down cutting steep, competent hillsides composed of igneous intrusions, fault blocks or volcanic extrusions; sometimes found in early glacial till deposits where stream is deeply incised into a more resistent rock layer; lava flows or other resistent rock layers may result in vertical canyon walls on one or both sides of the channel. One side may be a steeply incised, less resistent layer.





Other common characteristics

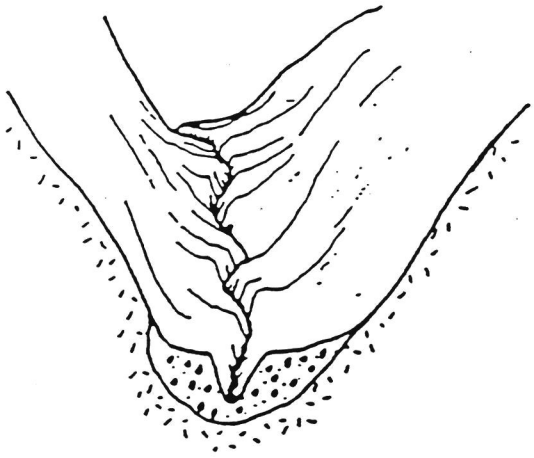
Substrate: bedrock, big boulder dominated, many areas sluiced to bedrock with deposition of rubble and boulder between.

Channel gradient: steep, generally >6%, although short sections of moderate gradient exists between steep bedrock areas.

Channel Type: Bedrock control,

LWD: Infrequent large jams; most individual pieces are moved out in flood events;

Code	Segment Type	Distinguishing Criteria
5	Incised Glacial Till or Incised Colluvium	Stream Order: 2, 3, 4



Valley bottom width: 1-2X ~~ACH~~ Normal high water

Side Slopes: immediate stream adjacent slopes moderate to steep due to downcutting through glacial till and colluvium surfaces; upper slopes tend to grade from flat to steep as elevation is gained.

Channel pattern: straight to slightly sinuous; occasional braids

Land Form Feature: streams downcutting through glacial deposits or colluvium originated substrate; downcutting has led to steep to moderate stream adjacent slopes with poorly consolidated upper bank material; this leads to moderate to high potential for bank failures.

Other common characteristics

Substrate: generally rubble/boulder; banks are generally composed of unsorted glacial drift material or colluvium deposition.

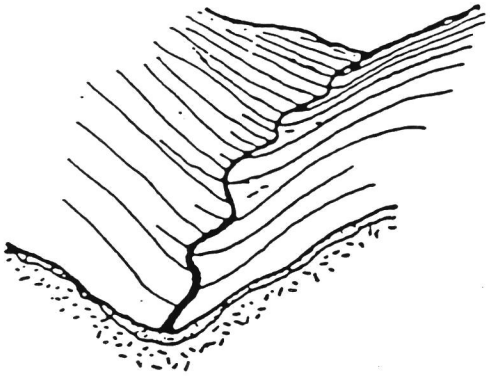
Channel gradient: 2 - 5%; alluvial deposition can reduce gradient to 0 - 3% in localized areas.

Channel Type: Boulder confined

LWD: Variable, often abundant single stems and occasional jams; jams and individual pieces are commonly deposited in high flow areas and where they contribute little to perennial habitat.

Code	Segment Type	Distinguishing Criteria
6	Moderate Slope bound Valley	Stream Order: 1, 2, 3

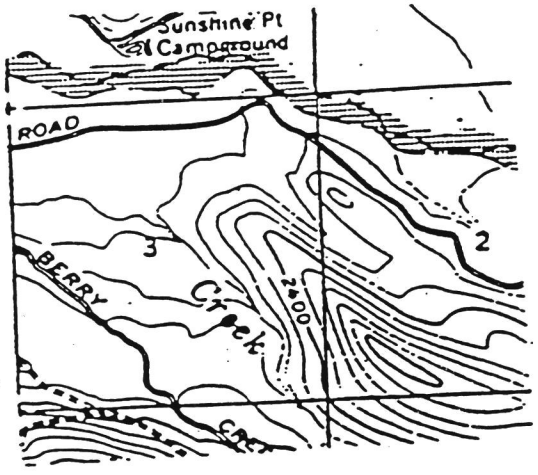
Valley bottom width: 1-2X ~~ACF~~ Normal high water



Side Slopes: moderate; occasional short sections of steep sidewalls.

Channel pattern: straight to slightly sinuous; occasional channel splitting

Land Form Feature: generally located in lower foothills and minor fault block areas; also found in upper drainage network where stream power is insufficient to deeply downcut underlying strata; immediate stream adjacent slopes range from nearly flat to moderately steep; the distinguishing characteristic separating this from other valley segment types is the low gradient upper side slopes.



Other common characteristics

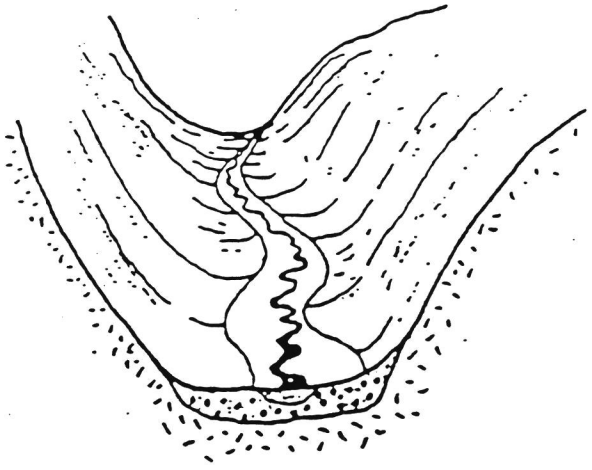
Substrate: cobble/rubble, local areas of rubble, boulder and bedrock.

Channel gradient: low to moderate, 1 - 5%

Channel Type: Alluvial, may be short areas of bedrock or boulder control.

LWD: Small jams and single stems are common; debris is an important pool former.

Code	Segment Type	Distinguishing Criteria
7	U-shaped Glacial Trough Valley	Stream Order: 1, 2, small 3



Valley bottom width: >5X ~~ACW~~ Normal high water

Side Slopes: flat, although stream sometimes is adjacent to glacial terraces and morianes.

Channel pattern: moderate to high meanders.

Land Form Feature: located in the bottoms and lower side slopes of U-Shaped glacial valleys; the present stream channel has not significantly downcut below the level of the valley floor and is free to meander; valley floor is generally composed of glacial deposits, but the active channel is filled with small substrate material from alluvial deposits.

Other common characteristics

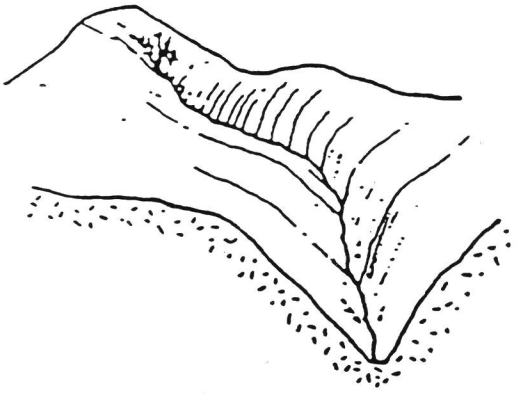
Substrate: ranges from fines to rubble depending on local stream gradient.

Channel gradient: low , 0 - 3%; can be short steep sections where stream downcuts terminal moraines.

Channel Type: Alluvial

LWD: Variable, depending upon vegetation type; segments in subalpine areas have little LWD, while segments in more developed timber stands have abundant small jams and single pieces creating habitat; LWD often critical in formation of high quality pool and cover.

Code	Segment Type	Distinguishing Criteria
8	Valley Wall/Headwall Tribuatary	Stream Order: 1, small 2



Valley bottom width: >1X ~~ACW~~ Normal high water

Side Slopes: moderate to steep

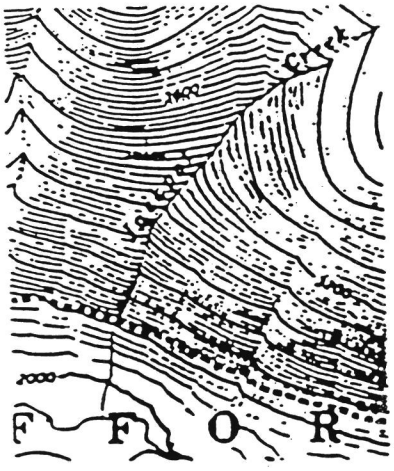
Channel pattern: straight; stairstep longitudinal profile

Land Form Feature: small tributaries flowing over moderate to steep competent hillsides, glacial scoured slopes, or glacial depositions; once a valley wall tributary enters a valley floor of a 5th or 6th order river it is considered a lower alluvial valley segment type.

Other common characteristics

Substrate: boulder/bedrock in steep sections: boulder, rubble in moderate gradient areas

Channel gradient: 1 - 5% near junction with larger streams, becoming very steep upslope on the valley wall, stairsteps create short sections of low gradient deposition between cascades.



Channel Type: Bedrock or boulder control

LWD: Variable, important in creating stairsteps; in steep bedrock secitons LWD is normally sluiced out; moderate to low gradient sections commonly have single pieces of LWD with infrequent jams creating rubble deposition upstream.

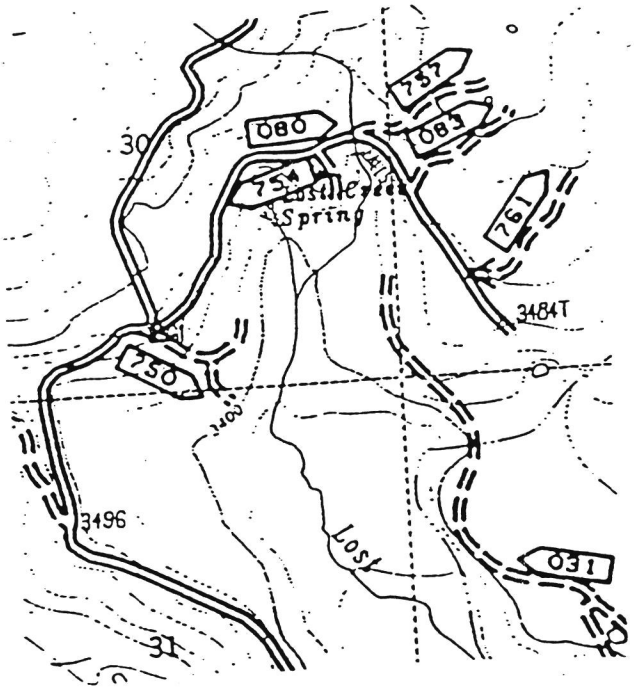
Code	Segment Type	Distinguishing Criteria
9	Lava flow/Spring fed Meadows	Stream Order: 1, small 2

Valley bottom width: > 5X ~~ACW~~ Abnormal high water
watershed boundaries poorly defined

Side Slopes: 0 - 10%

Channel pattern: slight meanders, resistent substrate prevents accelerated meandering.

Land Form Feature: Lava flows have generally low gradient slopes and very resistent strata; these segment types have very slight downcutting and valley development. Much of these valley segment types are found in association with Mt. Adams in the southern portion of the Forest.



Other common characteristics

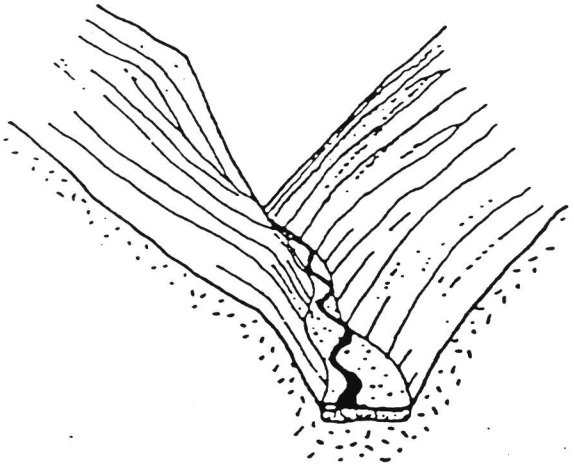
Substrate: fines to cobble; occasional boulders scattered along the banks and in-channel

Channel gradient: 0 - 3%

Channel Type: Alluvial or boulder control

LWD: Generally low, some infrequent large jams; beaver often are responsible for input of individual pieces; when LWD is present it normally creates good pool and cover habitat.

Code	Segment Type	Distinguishing Criteria
10	Alluviated Mountain Valley	Stream Order: 2, 3, 4



Valley bottom width: 2- 5X ~~ACW~~ normal high water

Side Slopes: Immediate stream adjacent slopes may be flat due to alluvial deposition, but upper valley slopes increase from moderate to steep.

Channel pattern: moderate to high meanders and braiding.

Land Form Feature: These valley segment types may be hard to distinguish from U-shaped glacial troughs with the distinguishing characteristic being the classic U-shaped valley form for the later being missing. These valley segments are formed from continual alluvial deposition; the stream generally flows over a relatively wide annual floodplain; they can also be formed from a reduction in stream energy leading to deposition of sediment and debris as a result of changes in formative factors such as bedrock constrictions and low gradient bed topography; valley bottoms are generally well established with vegetation.

Other common characteristics

Substrate: gravel/cobble/rubble dominate, although the upper end of this segment type may be dominated by small boulder.

Channel gradient: 0 - 3%

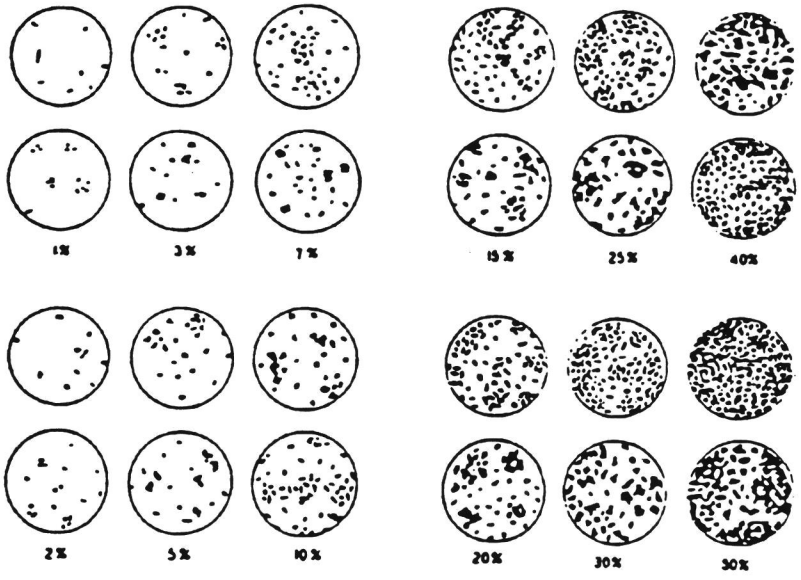
Channel Type: Alluvial

LWD: Common, frequent jams and single pieces create excellent pool habitat; undercut root-wad habitat common; large trees may be partially undercut in older sections of this valley type.

APPENDIX B

GUIDES FOR % FOLIAR COVER DETERMINATION

COMPARISON CHARTS FOR VISUAL
ESTIMATION OF FOLIAGE COVER



On a 500 m^2 plot, 1% = 7 ft. x 7 ft.
On a 5 x 10 m. plot, 1% = 1m. x 0.5 m.

Source: Terry, Richard D. and George V. Chilingar, 1955. Journal of Sedimentary Petrology, vol. 25, no. 3, pp. 229-234.

APPENDIX C

DESCRIPTIONS OF PREVIOUSLY-CLASSIFIED CONIFER FOREST TYPES

ABAM/MEFE C-1
ABAM/OPHO C-3
ABAM/VAAL C-5
ABAM/VAAL/COCA C-7
TSHE/ACTR C-8
TSHE/LYAM C-11
TSHE/OPHO/OXOR C-13
TSHE/OPHO/POMU C-15
TSHE/OPHO/SMST C-18
TSHE/POMU C-20
TSHE/POMU-OXOR C-22
TSHE/VAAL/COCA C-24
THPL-ABGR/ACTR C-26
THPL/ACTR C-29
TSHE-ABGR/CLUN C-32

Table 19: Productivity of the Pacific silver fir/fool's huckleberry association

Tree Species	Number of Cored Trees	Site Index (ft) Mean	SD	Current Radial Increment (20ths/ 10 yrs) Mean	SD	Growth Basal Area (ft^2/A) Mean	SD	Volume Index (ft^3/ A/yr) Mean	SD	Current Volume Increment (ft^3/ A/yr) Mean	SD	D.B.H. (in) Mean	SD	Tree Age (yrs) Mean	SD
Pacific silver fir	30	110	13	8	3	285	49	158	42	32	12	29	4	315	26
Noble fir	3	113	-	4	-	269	-	152	-	2	-	45	-	471	-
Western hemlock	15	113	15	4	2	249	89	140	52	15	3	35	5	407	23
Douglas-fir	10	103	7	4	1	206	71	108	44	7	2	43	9	450	29

Pacific Silver Fir/Fool's Huckleberry Association (CF S2-54) ABAM/MEFE

The Pacific silver fir/fool's huckleberry association is characterized by a tall, dense shrub layer dominated by fool's huckleberry (MEFE) and several huckleberry species. The herb layer is fairly diverse. Pacific silver fir and western hemlock dominate the overstory, but Douglas-fir is often present.

Composition and Structure

The ABAM/MEFE association is dominated by Pacific silver fir (average cover 31 percent) and western hemlock (average cover 24 percent) with a lesser presence and cover (20 percent) of Douglas-fir (Table 28). Western redcedar, noble fir, Engelmann spruce and western white pine occurred less frequently in the overstory. The regeneration layer is dominated by Pacific silver fir (cover 18 percent) and western hemlock (cover 5 percent), with western redcedar and Alaska yellow-cedar occurring less frequently and at lower relative cover.

The most characteristic feature is the diverse and dominant shrub layer with an average cover of 62 percent and total shrub cover near 100 percent on some plots. Fools huckleberry dominates the shrub layer (5 to 15 percent cover) along with one of three Vaccinium species, big huckleberry (VAME), Alaska huckleberry (VAAL) or ovalleaf whortleberry (VAOV). Their combined cover averages 42 percent. Dwarf bramble (RULA), sitka mountain ash (SOSI) and five leaf bramble (RUPE) are present in most stands at low coverage. The warm site shrub group is represented with cover generally less than 10 percent.

Although the herbaceous layer is obscured by dense shrubs, its cover averages 34 percent. Dogwood bunchberry (COCA) and queencup beadlily (CLUN) were the most frequently encountered herbs (70 and 78 percent respective constancy) followed by sidebells pyrola (PYSE), Pacific trillium (TROV), coolwort foamflower (TIUN), vanillaleaf (ACTR), beargrass (XETE), twinflower (LIBO2) and rosy twistedstalk (STRO). Average cover for CLUN, COCA, TIUN and XETE is over 5 percent.

Physiography and Soils

Slopes average 25 percent but range from nearly level to 66 percent (Table 34). Mean elevation is 3673 feet and aspects tend to be northerly. The soils on 50 percent of the plots contained a layer of lapilli and another 50 percent contained at least one layer with more than 50 percent rock. Effective rooting depth averaged 39 inches. Typically encountered TRI soil mapping units included 17, 18, 27, 41, 57, 92 and 561.

Productivity and Management Considerations

Overall productivity is moderate for stands in the Pacific silver fir/fool's huckleberry association. Values of site index for noble fir (113), western hemlock (113) and Pacific silver fir (110) were higher than that for Douglas-fir (103). Current stand volume increment was largely comprised of contributions from Pacific silver fir and western hemlock (Table 19). Volume index data indicated that Pacific silver fir, noble fir and western hemlock are potentially more productive in this association than is Douglas-fir.

Opportunities for intensive timber management are moderate in this association. Clearcutting may be practiced. Where high elevations and slopes less than 15 percent produce frost pockets, a shelterwood leaving about 30 percent of the initial basal area (or 75 to 85 ft^2/A) should provide adequate protection for seedlings. Douglas-fir is a common high value timber species in this association; however, it will suffer frost damage on slopes less than 15 percent and snow creep deformation on steeper slopes. It is therefore not well suited for reforestation in this association. Pacific silver fir, western white pine and Engelmann spruce are better suited to gentler slopes and noble fir, while generally not present in the original stand, is well suited on slopes over 15 percent. This association occurs in locations where soil moisture is abundant early it the growing season. Stand entry at this time with heavy equipment could cause soil compaction problems.

Comparisons

The ABAM/MEFE association is similar to the ABAM/MEFE habitat type described by Franklin et al. (1979) for Mt. Rainier National Park. Their type is similar to ours in the relatively few herbaceous species which have high fidelity within the type. Although our ABAM/MEFE association contains much less Cascades azalea, it is similar to the ABAM/MEFE association described by Franklin (1966) for the Mt. Rainier Province. An analogous type was not described by Dyrness et al. (1973) for the Central Cascades of Oregon. However, Hemstrom et al. (1982) described an essentially identical type on the Mt. Hood National Forest. Henderson and Peter (1981) described a similar type in the northern Washington Cascades. Appendix IV contains average floristic and productivity values for this association in the western Cascades.

Table 17: Productivity of the Pacific silver fir/devil's club association

Tree Species	Number of Cored Trees	Site Index (ft) Mean	SD	Current Radial Increment (20ths/ 10 yrs) Mean	SD	Growth Basal Area (ft^2/A) Mean	SD	Volume Index (ft^3/ A/yr) Mean	SD	Current Volume Increment (ft^3/ A/yr) Mean	SD	D.B.H. (in) Mean	SD	Tree Age (yrs) Mean	SD
Alaska yellow-cedar	8	124	6	7	1	429	12	270	8	6	1	49	15	565	134
Noble fir	5	134	-	12	-	406	-	268	-	12	-	41	-	180	-
Douglas-fir	22	132	2	6	3	388	112	253	56	25	36	52	17	504	300
Pacific silver fir	35	131	19	8	2	343	82	227	67	35	20	29	7	216	38
Western hemlock	26	123	23	6	3	333	123	209	91	20	16	35	12	305	142
Western redcedar	3	118	-	8	-	306	-	178	-	19	-	39	-	217	-

Pacific Silver Fir/Devil's Club Association (CF S3-51)
ABAM/OPHO

The Pacific silver fir/devil's club association is found on the wettest forested sites occupied by the Pacific silver fir series. It is one of the easiest types to distinguish in the field because it is characterized by large amounts of devil's club and a rich herb layer. Stands may be found growing on terraces, river bottoms or slopes where they may be associated with the abundant moisture of seeps or springs.

Composition and Structure

The canopy composition in this association is variable and includes Douglas-fir, noble fir, Pacific silver fir, western hemlock, western redcedar and Alaska yellow-cedar (Table 27). Pacific silver fir and western hemlock dominate in most stands, but Douglas-fir and noble fir are important seral species. Western redcedar and Alaska yellow-cedar are generally minor species. Pacific silver fir regeneration is predominant with lesser amounts of western hemlock. Both cedars also regenerate successfully in many devil's club communities.

Devil's club (OPHO) and several other shrubs dominate the shrub layer in this association. Ovalleaf whortleberry (VAOV), Alaska huckleberry (VAAL), five leaf bramble (RUPE) and dwarf bramble (RULA) are very common. A wide variety of shrubs occur with low constancy. The average shrub cover in this type is about 67 percent.

The herb layer in the ABAM/OPHO association contains a wide variety of wet site species including coolwort foamflower (TIUN), ladyfern (ATFI), deerfern (BLSP), oak fern (GYDR) and redwoods violet (VISE). TIUN and vanillaleaf (ACTR) are the most common plants with constancies of 100 and 96 percent, respectively. Other herbs with constancies greater than 50 percent include GYDR, Pacific trillium (TROV), ATFI, queencup beadlily (CLUN), starry solomonplume (SMST), sidebells pyrola (PYSE) and rosy twistedstalk (STRO).

Physiography and Soils

This association occurs in a variety of topographic positions betwen 2600 and 4600 feet elevation (Table 33). Sites in middle to lower slope position contained stony soils of volcanic ash or pumice origin. On lower slope sites colluvium was often present in the soil profile. Effective rooting depth averaged 43. On very steep rocky slopes, this association is present only where seeps or springs bring groundwater near the surface. Terraces, river bottoms and wet meadows contained soils developed from alluvium or glacial drift. Typically encountered TRI soil mapping units included 15, 16, 34, 39, 322, 418 and 428.

Productivity and Management Considerations

Overall productivity is high for stands in the Pacific silver fir/devil's club association. Site index values for noble fir (134), Douglas-fir (132) and Pacific silver fir (131) are higher than those for Alaska yellow-cedar (124), western hemlock (123) and western redcedar (118). Pacific silver fir, Douglas-fir and western hemlock are the highest contributors to current volume increment in stands of this association (Table 17). Volume index data indicate that Alaska yellow-cedar, noble fir and Douglas-fir are potentially the most productive species in this association. The high growth basal area values for Alaska yellow-cedar and noble fir indicate good diameter growth at higher stocking levels, thus a greater potential volume yield per acre.

This association does not cover large areas on the Gifford Pinchot National Forest but becomes more widespread further north. It often occurs in patches of less than five acres and is surrounded by more well drained types. Opportunities for intensive timber management are poor in this association. Clearcutting may be practiced, but with caution. Where frost pockets develop on slopes under 15 percent as typically encountered on high elevation benches,

a shelterwood leaving about 25 percent of the initial basal area (or 75 to 85 ft^2/A) should provide adequate protection for seedlings. Shelterwood is generally not required to regenerate this association. Timber harvesting may be difficult because of wet soils. Soil compaction and erosion could be major problems. Where this type occurs in small patches, adverse impacts to soils may be minimized by felling trees toward more stable soils in surrounding associations.

This association provides diversity within the matrix of drier forest types and should be managed with care to prevent erosion of the deep soils which are often saturated with water. Since this type occupies a small fraction of the landscape, it could be considered a special habitat providing biotic diversity and managed for purposes other than timber production. It is also an important animal habitat since the leaves of devil's club provide a preferred forage for elk during the late summer and early fall. The substantial shrub cover and frequent proximity to riparian areas make this association an important protective cover for wildlife.

Comparisons

Franklin et al. (1979) described an ABAM/OPHO habitat type in Mt. Rainier National Park which is similar to that described here. They found some stands with very reduced shrub layer, which we did not. This may be a result of the abundance of elk within Mt. Rainier National Park and their preference for devil's club foliage. Franklin (1966) found CHNO to be more prevalent and PIEN and ABGR to be major seral species, in contrast to our association. The shrub and herb composition are comparable. Dyrness et al. (1974) described a CHNO/OPHO habitat type in the Central Oregon Cascades which is closely analogous to our ABAM/OPHO association. Hemstrom et al. (1982) described an association in the Oregon Cascades essentially identical to our ABAM/OPHO type. Henderson and Peter (1982) reported a similar type in the Northern Washington Cascades. Appendix IV contains average floristic and productivity values for this association in the western Cascades.

Table 14: Productivity of the Pacific silver fir/Alaska huckleberry association

Tree Species	Number of Cored Trees	Site Index (ft) Mean	SD	Current Radial Increment (20ths/10 yrs) Mean	SD	Growth Basal Area (ft^2/A) Mean	SD	Volume Index (ft^3/A/yr) Mean	SD	Current Volume Increment (ft^3/A/yr) Mean	SD	D.B.H. (in) Mean	SD	Tree Age (yrs) Mean	SD
Western hemlock	51	102	12	8	2	293	59	148	34	33	17	31	7	332	103
Douglas-fir	27	111	14	6	2	264	66	146	37	12	7	44	13	456	205
Noble fir	7	104	28	10	5	256	43	138	62	2	-	28	6	240	190
Pacific silver fir	58	102	11	7	2	250	63	126	33	15	9	24	4	287	47

Pacific Silver Fir/Alaska Huckleberry Association (CF S2-57) ABAM/VAAL

The Pacific silver fir/Alaska huckleberry association is widespread on environmentally moderate sites. Timber stands are dominated by Pacific silver fir, western hemlock and Douglas-fir. Pacific silver fir is the climax dominant often associated with western hemlock. Douglas-fir up to 500 years old and 50 inches in diameter are common.

Composition and Structure

Pacific silver fir and western hemlock dominate (29 percent cover) the canopy (Table 26). Douglas-fir occurs in about 79 percent of the stands and averages 16 percent cover. Western redcedar occurs in only 38 percent of the stands and averages 7 percent cover. Although western hemlock regeneration is found in about 79 percent of the stands, Pacific silver fir regeneration is usually more than twice as abundant and is clearly dominant.

The ABAM/VAAL association is characterized by a prominent Vaccinium layer and lacks salal. Alaska huckleberry (VAAL) cover is generally greater than 20 percent with big huckleberry (VAME) and ovalleaf whortleberry (VAOV) cover between 5 and 10 percent. Warm site shrubs are generally inconspicuous.

The herb layer is highly variable containing queencup beadlily (CLUN), sidebells pyrola (PYSE), dogwood bunchberry (COCA), beargrass (XETE), Pacific trillium (TROV), twinflower (LIBO2), rattlesnake plantain (GOOB), vanillaleaf (ACTR) and alpine pyrola (PYAS). Herbaceous cover averages 14 percent. Where pumice deposits are a major portion of the soil profile, the herb layer is especially depauperate, generally including only PYSE and PYAS.

Physiography and Soils

The mean elevation is 3355 feet and all aspects are well represented (Table 32). About one-third of the plots fell on flats, benches or terraces with less than 15 percent slope. The plots averaged 24 percent slope and ranged from 2 to 75 percent slope. Soils are dominated by pumice. In over half of the stands, pumice or cinders comprised the entire rooting medium. In the remaining plots, volcanic ejecta (pumice, ash and cinders) were interbedded with colluvial, glacial or alluvial material. Soil depth ranged from 18 to 100 inches and averaged 58 inches (Table 32). Effective rooting depth averaged 37 inches. One-quarter of the plots had a layer with over 40 percent coarse fragments. Especially in the pumice soils, there is a tendency for an abnormal decrease in roots at about 15 inches depth. Typically encountered TRI soil mapping units included 20, 21, 26, 31, 34, 37, 65, 83, 92, 95 and 310.

Productivity and Management Considerations

Overall productivity is moderate for stands in the Pacific silver fir/Alaska huckleberry association. The site index value for Douglas-fir (111) was higher than values for noble fir (104), western hemlock (102) and Pacific silver fir (102). Current volume increment in these stands is dominated by western hemlock, Pacific silver fir and Douglas-fir (Table 14). However, volume index data indicated that western hemlock, Douglas-fir and noble fir are potentially the most productive species in this association.

This association offers good opportunities for intensive timber management. Clearcutting may be widely practiced. Where frost pockets develop on sites with slopes less than 15 percent, a shelterwood leaving about 25 percent of the initial basal area (or 70 to 80 ft^2/A) should provide adequate protection for seedlings. Generally, however, shelterwood is not needed to successfully regenerate this association. Regeneration of noble fir and Douglas-fir are both possible outside of frost prone areas.

Comparisons

Several authors have described Alaska huckleberry types but direct comparisons are difficult to make because this widespread type has been defined in various ways. The ABAM/VAAL association is close to that described by Dyrness et al. (1974) for the Central Cascades of Oregon and is similar to the ABAM/VAAL/BENE habitat type described by Franklin (1966) for the Mt. Rainier Province. Franklin's type is dominated by Douglas-fir, western hemlock, western redcedar and Pacific silver fir with an understory of red huckleberry (VAPA), dwarf Oregon grape (BENE), VAAL, VAOV, vine maple (ACCI) and salal (GASH). His type had a richer herb layer and often included coolwort

foamflower (TIUN) and vanillaleaf (ACTR). The ABAM/VAAL association is also similar to the more herb rich ABAM/VAAL(BENE) type described in the Mt. Rainier study (Franklin et al. 1979). The ABAM/VAAL/COCA association described by Hemstrom et al. (1982) is similar to our ABAM/VAAL association. Henderson and Peter (1981 and 1982) describe an ABAM/VAAL association which is similar to that described here. Appendix IV contains floristic averages for this association where it has been described in the western Cascades.

CFS253
ABAM/VAAL/COCA

Most of our samples in this association are from old-growth stands in drainage bottoms or on benches near streams. Douglas-fir, western hemlock and Pacific silver fir dominate the canopy (Appendix I). Noble fir and western redcedar are prominent on some sites. Pacific silver fir, western hemlock and, occasionally, western redcedar dominate the regeneration layer.

The shrub layer is usually dense. Alaska huckleberry, oval-leaf huckleberry, big huckleberry, vine maple, and rhododendron contribute to the diverse shrub layer which averages 59 percent cover. Red huckleberry, dwarf Oregon grape and trailing blackberry may also be present. Rhododendron cover is less than 30 percent.

Dogwood bunchberry, twinflower, vanilla leaf, beargrass and queencup beadlily are the most common and abundant herbs. The herb layer is well developed, averaging 37 percent cover, and may contain several additional species, especially Pacific trillium, threeleaf anemone, starry solomonplume, coolwort foamflower, and sidebells pyrola. In general, this association is more herb rich and productive than the rhododendron-Alaska huckleberry/dogwood bunchberry association.

Environmental Conditions

The Alaska huckleberry/dogwood bunchberry association indicates mesic, relatively productive conditions (Fig. 1). It occurs on a wide range of lower and mid-slope landforms, often near streams, from 2,700 to 4,500 feet (820 to 1360 m) elevation (Table 6). Slopes are typically gentle, flat to 25 percent, and usually face northwest to east. Soils are usually deep, from 18 to over 60 inches (45 to over 150 cm), and occasionally stony. Soil texture is usually silt loam, clay loam, or loam, becoming more clayey near the bottom of the profile. Soils are frequently developed in colluvium, residuum or tephra. The presence of moist-site indicating herbs combined with topographic location imply a cool, moist, well-drained environment.

Productivity and Management Implications

The Pacific silver fir/Alaska huckleberry/dogwood bunchberry association is moderately productive and easy to manage for timber. Douglas-fir and noble fir site indices average 102 and 110 respectively (Table 5). As in most of the Pacific silver fir zone, noble fir will probably produce more volume than Douglas-fir in managed stands. Volume growth appears to culminate at about 125 ft^3/A./yr (Table 5). Stand density index productivity estimates average 118 ft^3/A./yr. Growth basal area productivity estimates rank volume productivity in the Alaska huckleberry/ dogwood bunchberry association between that of the cooler, higher elevation associations and the more moist, warm associations.

Regeneration may be complicated by frost in cold air accumulation areas but should not generally be difficult (Table 3). In frost-prone areas, western white pine or Englemann spruce should be planted. On dry, warm slopes Douglas-fir should do well, otherwise noble fir will produce high volumes without suffering frost damage.

This association typically occurs near streams or in protected draws. Natural fires are infrequent and stands are usually old. Watershed and wildlife values may be high. Soils are usually well drained and not saturated except shortly after snowmelt.

Comparisons

This association is almost identical to the Pacific silver fir/Alaska huckleberry/dogwood bunchberry association in the H. J. Andrews Experimental Forest (Dyrness et al. 1974). Similar associations have been described north of the Columbia River; Pacific silver fir/ Alaska huckleberry - typic (Franklin et al. 1979, Emmingham and Hemstrom 1981) and Pacific silver fir/ Alaska huckleberry (Henderson and Peter 1981a). This is the most widespread Pacific silver fir zone association in the central and northern Washington Cascades but becomes increasingly rare farther south. It is fairly common on the Mt. Hood National Forest but uncommon at the south end of the Willamette National Forest.

TSHE/ACTR

CHF2-21

WESTERN HEMLOCK/VANILLA-LEAF

Tsuga heterophylla/Achlys triphylla

Structure and Composition

This association includes the productive heart of the Gifford Pinchot National Forest. It is very widespread within the Western Hemlock Zone. Tree cover is predominantly Douglas-fir with western hemlock having greater importance in old stands. Western redcedar is occasionally abundant. Both grand fir and Pacfic yew also were found on some of our plots. The grand fir is found either on relatively hot and dry sites or on alluvial plains with gravelly soils, such as near the Lewis and Cispus Rivers. Moist-site species, such as devil's club, Oregon oxalis and oak fern, are essentially absent. Swordfern is usually present but always in small amounts. A diverse assemblage of herbs constitute a substantial portion of the understory vegetation. These range from moderately-moist site affiliates (such as inside-out flower and star-flowered Solomon's seal) to moderately-dry site indicating species: bigleaf sandwort, white hawkweed and grass species. Vanillaleaf is virtually always present; it is often accompanied by pathfinder, three-leaved anemone, starflower, trillium and twinflower. Shrub cover can be quite high, but if so, it is in conjunction with high cover of the herb species mentioned above. Vine-maple and dwarf Oregon grape are prevalent. Baldhip rose, creeping snowberry, red huckleberry and California hazel are also frequently present but with less cover. Salal occurs in small amounts. In general, sites in this association having greater than 10% cover of dwarf Oregon grape exhibit lower timber productivity and have floristics indicative of slightly drier environments than sites where dwarf Oregon grape is not abundant. The diagnostic feature of the Western Hemlock/Vanillaleaf association is the plethora of mesic-site herb species and the lack of shrubs common to either very moist or very dry environments. Appendix 3 contains complete vegetation data for this association.

Environment and Distribution

This association indicates well-drained, fairly warm upland forest sites. Generally it represents moderate environmental conditions, except for potentially hot and dry situations on south-facing slopes. Water-logged soils and cold temperatures should almost never interfere with logging or reforestation operations. This association is located

mostly on slopes, usually with grades greater than 30%. Soils are generally fairly deep and not very rocky. On the G. P. NF this association may be found at all elevations within the Western Hemlock Zone; it is more common on the southern part and is uncommon on the western part of the Forest. Table 2 summarizes physiographic information for this association.

Productivity and Management

Stands of this association attain highly productive levels without substantial management problems. Stocking and productivity indices are usually quite high, though variation occurs. The average site index (at 100 years) was 140 feet for Douglas-fir and 120 feet for western hemlock. The stand density index value of 439 and average total basal area of 305 ft^2/acre are among the highest of any Western Hemlock Zone association. See Tables 28 and 16 and Appendix 2) for more timber productivity information.

Table 28. Timber Productivity Statistics - TSHE/ACTR

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	139	21	12	6	402	136	152	30	64	52
Western hemlock	120	19	12	5	416	156	169	38	35	20
Western redcedar	116	27	13	4	505	221	143	53	35	37
Cottonwood	165	21	24	5	723	30	228	35	33	47
Grand fir	122[5]	34	13	10	431	208	127	48	45	42
Red alder	77[5]	-	10	-	291	-	79	-	36	-

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western hemlock, Barnes 1962; Western redcedar & cottonwood, Hegyi et al. 1981; Noble fir, Herman et al. 1978; Grand fir, Cochran 1979; red alder, Worthington et al. 1960
2. Hall 1983.
3. See discussion of Timber Productivity in Chapter 2 for references.
4. Methods after Hemstrom 1983.
5. site index age 50

This association includes much of the best land suitable for timber management on the G.P. Intensive forestry practices yield high benefits and the potential for site degradation following careful management activities is relatively low. Major potential management concerns result from occasional steep slopes and relatively dry conditions. Some sites within this association share, to a lesser degree, the drought conditions of dry-site Western Hemlock Zone associations. Managers need to be alert to such dry conditions on very steep or south-facing slopes, where shade cards and harvest unit design maximizing shade are appropriate. Shrub competition may also cause reforestation problems. This can result from rapid reinvasion by established brush following logging or from invasion, particularly by snowbrush ceanothus, after slash burning.

TSHE/ACTR is geographically widespread in the lower elevation portions of the Western Hemlock Zone and comprises a substantial portion of the winter range found on this National Forest. Browse production and the relatively long snow-free season also provide benefits to ungulates. Visual values may also be high as this association covers much of the highly visible mid-slopes of the lower elevations.

Similar Associations

The relative absence of the more severe-site indicating species is what helps distinguish this association. Dwarf Oregon grape may be abundant, but if so, it is in combination with several herb species and so is distinguished from the TSHE/BENE association. There is always less salal than in the TSHE/BENE-GASH and TSHE/GASH associations. TSHE/ACTR occurs in much warmer and drier environments than the Pacific Silver Fir/ Vanillaleaf-Queencup Beadlily Association previously described on the G.P. (Brockway et al. 1983).

This association is widespread throughout most of the western Cascades of Washington and Oregon. Very similar types exist in Mount Baker-Snoqualmie N.F. (Henderson and Peter 1981b), Mt. Rainier National Park (Franklin et al. 1979), and Willamette N.F. (Hemstrom et al. 1985).

TSHE/LYAM

CHM1-21

WESTERN HEMLOCK/SKUNK-CABBAGE

Tsuga heterophylla/Lysichitum americanum

Structure and Composition

This association is found in very wet sites, and is rich in moisture-loving herbaceous species. The dominants are lady-fern, skunk cabbage, betony, a variety of sedges and rushes, wild ginger and piggy-back plant. The major shrub is vine maple. The canopy is generally a mix of Douglas-fir, red alder, western hemlock and western redcedar. Species composition in all layers (overstory, shrubs and herbs) varies considerably from site to site, as this group is somewhat of a "catch-all" for swampy Western Hemlock Zone sites. A notable feature of this association is the open, broken canopy, caused by a combination of disease-related top damage, windthrow and treeless patches of standing water. Summary vegetation data are in Appendix 3.

Often the TSHE/LYAM association is either transitional to non-forest wetland, or represents small "pockets" of swampy conditions within a larger, more mesic area.

Environment and Distribution

The TSHE/LYAM association occurs in the wettest parts of the Western Hemlock Zone. It also occurs on the Mt. Hood National Forest (Halverson et al. 1986). It is found at moderate elevations in riparian areas, such as alluvial bottoms or other wet, poorly-drained sites. There may be standing water, and soils tend to have a very high organic matter content with peat-like surface layers.

Productivity and Management

The TSHE/LYAM association represents moderate to low productivity. Stocking, standing volume and volume growth are generally lower than average (Table 18, 16 and App. 2).

Because these sites are excessively moist, decreased productivity due to soil erosion and/or compaction can result from ground disturbance. In addition, poorly aerated soils with high organic material content may be difficult to reforest following logging. Such soils are not only physically hard to work in, but may have chemical conditions unfavorable to the growth of Douglas-fir. In addition, shallow rooting may contribute to a greater

potential for windthrow in certain sites. Western redcedar, red alder or black cottonwood should be used for reforestation where "swampy" conditions prevail.

TSHE/LYAM sites frequently occur as small patches within continuous western hemlock zone stands of upland associations. This pattern diversity leads to very high wildlife diversity. These moist patches may have far greater value than their small size suggests because many moisture-requiring species, such as amphibians, can use these sites as safe home bases from which they may forage into the nearby upland asociations.

Similar Associations

The TSHE/LYAM association is easily distinguished from other riparian types by the presence of skunk-cabbage. It is not likely to be confused with any other associations. The Western Hemlock/ Lady fern (TSHE/ATFI) association is also very moist but lacks the excessive water which characterizes the skunk-cabbage sites.

TSHE/LYAM has not been formally described in previous western Cascade plant association studies.

Table 18. Timber Productivity Statistics - TSHE/LYAM

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	120	-	23	22	408	294	124	-	n.d.	n.d.
Western redcedar	102	-	27	-	812	-	113	-	75	-

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western redcedar, Hegyi et al. 1981.
2. Hall 1983.
3. See discussion of Timber Productivity in Chapter 2 for references.
4. Methods after Hemstrom 1983.

TSHE/OPHO/OXOR
CHS5-22

WESTERN HEMLOCK/DEVIL'S CLUB/OXALIS

Tsuga heterophylla/Oplopanax horridum/Oxalis oregana

Structure and Composition

The vegetation of this rich and productive association is characterized by a carpet of Oregon oxalis and swordfern under a layer of devil's club. Traces of other moist-site herbs, such as starry solomonseal, lady fern, and fairy-bells are fairly common, and vine maple and red huckleberry may also be present in the shrub layer. As in the TSHE/LYAM association, the canopy is often quite open, and may contain a relatively large number of defective tops. Dominant overstory species are Douglas-fir, western hemlock and western redcedar.

Environment and Distribution

The TSHE/OPHO/OXOR association occupies warm, wet sites in the lower and middle portions of the Western Hemlock Zone (ranging from about 1300 to 2600 feet in elevation). Our plots occured mainly in riparian areas, often on colluvial toe slopes where water seeps and accumulates. This association probably indicates a year-round saturated soil condition.

Productivity and Management

The TSHE/OPHO/OXOR association represents, on the average, the most productive sites in the Western Hemlock Zone. Even though stocking is somewhat low, per acre volume productivity remains high (Table 18) due to the very large size of trees. This reflects the abundant moisture, deep, fine-textured soil and high level of soil organic matter characteristic of sites where the association is found.

Because these sites may be excessively moist, decreased productivity due to soil erosion and/or compaction may result from ground disturbance. In addition, poorly aerated soils with high organic material content may be difficult to reforest following logging. Such soils are not only physically hard to work in, but may have chemical conditions unfavorable to the growth of Douglas-fir. Also, shallow rooting may contribute to increased likelihood of windthrow in certain sites. Use of western redcedar, red alder or black cottonwood may be considered for reforestation where "swampy" conditions are found.

Table 18. Timber Productivity Statistics - TSHE/OPHO/OXOR

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	161	22	12.0	11.0	335	212	144	13	25	18
Western hemlock	133	21	21.0	14.0	288	108	193	40	30	4

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western hemlock, Barnes 1962.
2. Hall 1980.
3. See discussion of Timber Productivity in Chapter 3 for references.
4. Methods after Hemstrom 1982.

Similar Associations

The TSHE/VAAL-OPHO (Western hemlock/Alaska huckleberry-Devil's club) association is floristically similar, but always has Alaska huckleberry. It usually lacks lady-fern and swordfern, but has deerfern. It occurs at higher elevations than the TSHE/OPHO/OXOR association and is less productive.

The TSHE/POMU-OXOR (Western hemlock/Swordfern-Oregon oxalis) association lacks devil's club, and occurs on better-drained sites.

TSHE/OPHO/POMU

CHS5-24

WESTERN HEMLOCK/DEVIL'S CLUB/SWORD FERN

Tsuga heterophylla/Oplopanex horridum/Polystichum munitum

Structure and Composition

The Western Hemlock/Devil's Club/Swordfern Association occurs in very moist sites where soils remain saturated throughout the year. It is characterized by devil's club and a suite of other moisture-loving plant species. These may include Oregon oxalis, coolwort foamflower and inside-out flower. Besides the high cover of swordfern, several other fern species are common and occasionally abundant. These moist-site indicator ferns are deerfern, maidenhair fern, lady fern, oak fern, and wood fern. Vine maple is abundant. The wet soils, the overall herb richness, as well as the shrubby character are what give the this association its distinctive lushness. Complete vegetation data for this association are presented in Appendix 3.

The tree canopies found in this association are about equally composed of Douglas-fir and western hemlock. Red alder, western redcedar and bigleaf maple are occasionally found. In general, the canopies are fairly open, reflecting the water-logged nature of these sites. Some of the largest trees found on the G.P. occur in old-growth stands of this association.

Environment and Distribution

The characteristic wetness of sites with this association generally has three causes: proximity to water, exceedingly high rainfall or impeded soil drainage. Our sample plots are either near the western edge of the G.P. where rainfall is highest or in lower slope and bottom topographic positions. Devil's club/swordfern sites may occur on any aspect or any slope steepness. Typical locations include slopes near watercourses or in heavy rainfall areas, or flat areas with impeded drainage. TSHE/OPHO/POMU is most frequent in low areas of the Cispus River Valley.

Productivity and Management

The Western Hemlock/Devil's Club/Swordfern association is among the most productive on the G.P. It is unlikely that water is ever limiting, even during summer drought. In fact, production may be reduced where water-saturated, oxygen-poor soils exist. Site index (at 100 years,

McArdle) for Douglas-fir averaged 172 feet, the highest value of any association in this forest zone (see Tables 20 and 16 and Appendix 2). Although the total basal area and tree canopy cover found in this association is fairly low, the trees that do find suitable microsites grow rapidly and may attain large size.

This association clearly indicates that a site is excessively wet and prone to compaction and erosion if disturbed. Because of the high productivity of these sites, intensive management is tempting, yet substantial long-term reductions in productivity are possible because of fragile soils. Clearcuts should only be used with great care in this association. It may be better to exercise selective harvesting methods. Road-building in the Western hemlock/ Devil's club/Swordfern association also needs to be conducted with due regard for the fragile nature of the wet soils. When clearcut, reforestation should proceed with speed because red alder is especially likely to dominate these sites. Mountain beaver may also be abundant and can slow reforestation success. This association is heavily used by both deer and elk, including some of the heaviest winter range use. There is an abundance of quality forage, and the complex, multi-storied canopies provide exceptional hiding cover for big game. Small areas of standing water are common and provide wildlife habitat for many species. The Western Hemlock/Devil's Club/Swordfern Association has the highest wildlife value of any forest-zone association in the western hemlock zone.

Similar Associations

Western hemlock/Lady fern association is very similar and also has persistently moist soils. It is not so shrubby as TSHE/OPHO/POMU. The TSHE/POMU-OXOR, TSHE/POMU and TSHE/TITR associations are also moist site types, but they do not indicate such excessive moisture and they all lack devil's club.

The Western Hemlock/Devil's Club/Swordfern Association is closely allied with other forest communities having prominent devil's club cover described by other authors. It is very much like the Pacific Silver Fir/Devil's Club Association previously described for the Gifford Pinchot N.F. (Brockway et al. 1983) except that the absence of silver fir indicates a much warmer environment. The Western Hemlock/Devil's Club Association described in Mt. Rainier National Park (Franklin et al. 1979) is nearly identical to this type, except that in Mt. Rainier more oak fern and queencup are indicative of a slightly cooler

Table 20. Timber Productivity Statistics - TSHE/OPHO/POMU

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	172	21	15	7	556	133	198	29	54	46
Western hemlock	126	5	16	9	579	384	180	9	72	50
Western redcedar	134	-	11	-	532	-	164	-	28	-

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western hemlock, Barnes 1962; Western redcedar, Hegyi et al. 1981.
2. Hall 1983.
3. See discussion of Timber Productivity in Chapter 2 for references.
4. Methods after Hemstrom 1983.

climate. The Mt. Baker-Snoqualmie N.F. probably has the exact same association as this on the G.P. N.F. The Mt. Hood N.F. (Halverson et al. 1986) has Western Hemlock/Devil's Club/Oregon Oxalis and Western Hemlock/Devil's Club/Alaska Huckleberry associations which are very much like the devil's club/swordfern type on the G.P. N.F. The Western Hemlock/Devil's Club Association on the Willamette N.F. (Hemstrom et al. 1985) differs slightly from this on the G.P. in that it lacks oak fern and Alaska huckleberry.

TSHE/OPHO/SMST
CHS5-23

WESTERN HEMLOCK/DEVIL'S CLUB/STARRY SOLOMONSEAL
Tsuga heterophylla/Oplopanax horridum/Smilacina stellata

Structure and Composition

At first glance, a stand with this association appears floristically similar to TSHE/OPHO/OXOR (Western hemlock/Devil's club/Oregon oxalis), but further observation will show the lush understory to consist of a number of moist-site herbs (starry solomonseal, dogwood bunchberry, vanillaleaf, inside-out flower, queencup beadlily, and coolwort foamflower). Oregon oxalis is completely absent. Devil's club is the dominant shrub, with lesser amounts of vine maple and red huckleberry. The overstory is a mix of western hemlock and Douglas-fir, and as other wet-site associations is afflicted with a relatively large amount of breakage and mortality due to disease and windthrow.

Environment and Distribution

The TSHE/OPHO/SMST association is found east of the Cascade crest, along major creeks at the upper end of the Western Hemlock Zone. It is likely that this association extends lower in elevation, but since the lower reaches of these drainages have been logged, they were not sampled in this project.

TSHE/OPHO/SMST is found in sites where soils are saturated virtually year-round.

Productivity and Management

The TSHE/OPHO/SMST association is found in the most productive Western Hemlock Zone sites east of the Cascade crest. Stocking is somewhat lower than average, but per acre volume growth and site index are high (Table 19). As in the TSHE/OPHO/OXOR association, this appears to be a function of an accumulation of water and nutrients, as well as deeper soil on toe slope positions.

Because these sites may be excessively moist, decreased productivity due to soil erosion and/or compaction may result from ground disturbance. In addition, poorly aerated soils with high organic material content may be difficult to reforest following logging. Such soils are not only physically hard to work in, but may have chemical conditions unfavorable to the growth of Douglas-fir. Also, shallow rooting may contribute to an increased potential for windthrow. Use of western redcedar, red alder or black cottonwood should be considered for reforestation in sites where "swampy" conditions prevail.

Table 19. Timber Productivity Statistics - TSHE/OPHO/SMST

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	146	9	6.8	4.1	212	66	162	-	n.d.	n.d.
Noble fir	120	-	6.0	-	126	-	142	-	n.d.	n.d.

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Noble fir, Herman et al. 1978.
2. Hall 1980.
3. See discussion of Timber Productivity in Chapter 3 for references.
4. Methods after Hemstrom 1982.

Similar Associations

The TSHE/OPHO/SMST association could possibly be confused with only two other associations, both of which are found west of the Cascade crest. They are TSHE/VAAL-OPHO (Western hemlock/Alaska huckleberry-Devil's club) and TSHE/OPHO/OXOR (Western hemlock/Devil's club/Oregon oxalis). Both have Oregon oxalis, which does not occur in the TSHE/OPHO/SMST association.

TSHE/POMU

CHF1-25

WESTERN HEMLOCK/SWORDFERN

Tsuga heterophylla/Polystichum munitum

Structure and Composition

The Western Hemlock/Swordfern Association includes warm and moist sites which have substantial herb cover dominated by swordfern. Species indicative of more moist associations, such as devil's club, Oregon oxalis and coolwort foamflower may be present, but in low abundance. Most of the fairly dense overstory is Douglas-fir, often associated with western hemlock, bigleaf maple, red alder and western redcedar. This is one of the best associations for bigleaf maple growth. Except for fairly substantial vine-maple cover, the shrub layer is usually not dense. Dwarf Oregon grape is present in small amounts. Red huckleberry and trailing blackberry also frequently occur. Salal, dogwood, Alaska huckleberry and oceanspray are occasionally present in very small amounts. Besides swordfern, three-leaved anemone, inside-out flower, sweet-scented bedstraw, trillium and pathfinder sometimes cover fairly large areas. Wet site ferns (oak fern, deer fern, lady fern) may exist sporadically. Appendix 3 summarizes vegetation data representative of this association.

Environment and Distribution

This association is found on moist sites which may recieve some sub-surface irrigation, a reflection of the concave, lower slope positions it most commonly occupies. We found it mainly at low elevations, away from the western edge of the Forest. Slope steepness on our plots averaged 40%, but this association also may occur in flat areas near streams. Physiographic data are summarized in Table 2. Steeper sites may have some bare ground caused by colluvial action.

Productivity and Management

This is another of the moist-site, high-productivity plant associations of the western hemlock zone. Douglas-fir site index (100 years, McArdle) averaged 161 feet. Tables 24 and 16 and Appendix 2 summarize productivity data from our plots.

The presence of seeps or super-saturated soils indicates that land-managers need to be cautious concerning soil

Table 24. Timber Productivity Statistics - TSHE/POMU

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	161	22	14	6	504	161	182	30	65	58
Western hemlock	137	19	13	5	431	169	202	37	38	19
Western redcedar	125	30	25	12	936	606	150	48	33	14

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western redcedar, Hegyi et al. 1981.
2. Hall 1983.
3. See discussion of Timber Productivity in Chapter 2 for references.
4. Methods after Hemstrom 1983.

compaction or erosion due to heavy equipment or road-building. Because of the abundant moisture, red alder may become readily established on clear cuts, so prompt reforestation is a must. The general presence of deep soils and rapidly decomposing forest floor layers suggests that slash burning should have little effect on long-term productivity. The Western Hemlock/Swordfern Association provides great opportunities for intensive forest management. Tree improvement, fertilization, pre-commercial and commercial thinning are all especially appropriate when managing this association because the high timber production potential suggests that a high return on investment is likely. Because bigleaf maple and western redcedar are well represented in natural stands, sites with this association should play an important role for the long-term maintenance of these species on the Forest.

Similar Associations

The TSHE/POMU association is similar to the other moist-site types described in this paper (Western hemlock/ Devil's club/ Swordfern, Western hemlock/ Lady fern, Western hemlock/ Swordfern- Oregon oxalis, Western hemlock/ Coolwort foamflower) but it lacks an abundance of Devil's club, lady fern, Oregon oxalis or coolwort foamflower.

Similar plant associations exist on moist sites throughout much of western Washington and Oregon. Similarly named associations, which are nearly identical to our TSHE/POMU, are found in Mt. Rainier National Park (Franklin et al. 1979), on the Mt. Baker-Snoqualmie (Henderson and Peter 1981b), Willamette (Hemstrom et al. 1985) and Siuslaw (Hemstrom and Logan 1984) National Forests, and on the H.J. Andrews Experimental Forest (Dyrness et al. 1974). The TSHE/POMU-MTH association found on the Mt. Hood National Forest (Halverson et al. 1986) has a substantially lower productive potential. It occurs primarily on steep, rocky slopes and includes several plant species indicative of drier environments than TSHE/POMU occupies on the Gifford Pinchot National Forest.

TSHE/POMU-OXOR
CHF1-24

WESTERN HEMLOCK/SWORDFERN-OXALIS
Tsuga heterophylla/Polystichum munitum-Oxalis oregana

Structure and Composition

The TSHE/POMU-OXOR association is probably the most visually appealing association of the Western Hemlock Zone. Many stands with this association are old growth, with huge, widely-spaced Douglas-firs, western hemlocks and western redcedars towering over a lush carpet of Oregon oxalis interspersed with swordfern. The shrub layer is usually sparse, consisting of an occasional vine maple, dwarf Oregongrape or red huckleberry. In the herb layer, other moist-site species may occur in addition to Oregon oxalis: mountain woodfern, deerfern, ladyfern, starry solomonseal, coolwort foamflower, inside-out flower and fairybells.

Environment and Distribution

The TSHE/POMU-OXOR association is found at low to mid-elevations in the Western Hemlock zone on sites with abundant moisture and productive soils. Many of our plots with this association were in alluvial areas or moist toe slopes where fine soil particles and nutrients collect. Effective rooting depth and forest floor thickness both tend to greater than average. In general, this association occurs on flatter slopes, although exceptions are found.

This association occurs mainly in the lower reaches of the Bull Run, Sandy and Clackamas River drainages and on the western edge of the Gifford Pinchot National Forest (Topik et al. 1986).

Productivity and Management

The TSHE/POMU-OXOR association generally indicates productive, easy-to-manage sites. After the TSHE/OPHO/OXOR (Western hemlock/Devil's club/Oregon oxalis) association, this is the most productive of the lower-elevation Western Hemlock Zone associations. Productivity statistics for this association are found in Table 21.

The presence of this association generally indicates conditions favorable for most management activities. Moisture is usually abundant, and soils tend to be deep, adequately drained, and fertile. An abundance of deerfern in stands of this association may indicate local areas of high water table, where the risk of soil erosion and compaction is greater than usual.

Table 21. Timber Productivity Statistics - TSHE/POMU-OXOR

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	157	18	14.0	5.0	463	127	176	26	64	43
Western hemlock	145	18	18.0	6.0	527	199	218	35	90	48
Western redcedar	141	7	28.0	10.0	706	119	170	10	63	-

1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western hemlock, Barnes 1962; Western redcedar, Hegyi et al. 1981.
2. Hall 1980.
3. See discussion of Timber Productivity in Chapter 3 for references.
4. Methods after Hemstrom 1982.

Similar Associations

The TSHE/VAAL/OXOR (Western hemlock/Alaska huckleberry/Oregon oxalis) association has significantly more Alaska huckleberry than the TSHE/POMU-OXOR association, as well as more moist-site herbs besides Oregon oxalis. It is less productive , occurs at higher elevations and is more restricted to the Bull Run River drainage and portions of the Gifford Pinchot National Forest.

In the TSHE/OPHO/OXOR (Western hemlock/Devil's club/Oregon oxalis) association, devil's club is present. It occurs on poorly-drained sites and usually indicates greater productivity.

The TSHE/BENE/POMU (Western hemlock/Dwarf Oregongrape/Swordfern) and TSHE/POMU (Western hemlock/Swordfern) associations lack Oregon oxalis, are less productive than TSHE/POMU-OXOR and occur on steeper, rockier sites.

TSHE/VAAL/COCA
CHS6-15

WESTERN HEMLOCK/ALASKA HUCKLEBERRY/DOGWOOD BUNCHBERRY

Tsuga heterophylla/Vaccinium alaskaense/Cornus canadensis

Structure and Composition

This association has an abundance of huckleberry species, including Alaska, oval-leaf, red, and big huckleberry. Dogwood bunchberry and twinflower were present in nearly all of our plots. The canopy is dominated by Douglas-fir in younger stands and western hemlock in stands over 100 years old. Western redcedar is very common and Pacific silver fir may be found. In addition to the abundant huckleberry cover, the shrub layer is dominated by vine-maple and lesser amounts of dwarf Oregongrape and baldhip rose. Salal is common but occurs only in small amounts. Herb cover is fairly high, including dogwood bunchberry, twinflower, queencup beadlily, coolwort foamflower and vanillaleaf. Fern species other than swordfern are almost entirely absent. Moss cover is quite substantial.

Environment and Distribution

This association is in the cooler portion of the Western Hemlock Zone and may intergrade with the Pacific Silver Fir Zone. Moisture conditions are moderately high. It occurs on both the Gifford Pinchot and Mt. Hood National Forests, mainly above 2500 feet in elevation. This association has a limited distribution, but usually is found on flat benches or lower slopes. It also may be found on alluvial plains or colluvial toe slopes. Cold air accumulates on these sites and may account for the presence of this association at lower elevations within the Western Hemlock Zone. The forest floor usually has intermediate surface organic matter accumulations typical of cooler environments. The cool, moist environment may also be responsible for the preponderance of old-growth stand conditions found in this association, demonstrating a low occurrence of wildfire.

Productivity and Management

Relative to the rest of the Western Hemlock Zone, this association has intermediate potential productivity. Stocking and productivity indices were in the lower midrange for the Western Hemlock Zone (Table 26).

Table 26. Timber Productivity Statistics - TSHE/VAAL/COCA

Species	Site Index[1] (feet)		Current 10-yr. Radial Increment (20ths)		Growth Basal Area[2] (ft^2/ac)		Mean Annual Inc. at Culmination[3] (ft^3/ac/yr)		Current Overstory Vol. Inc.[4] (ft^3/ac/yr)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Douglas-fir	135	22	8.0	9.0	349	113	146	31	18	18
Western hemlock	125	24	9.0	4.0	375	153	178	47	34	28
Noble fir	131	-	5.0	-	347	-	160	-	n.d.	n.d.

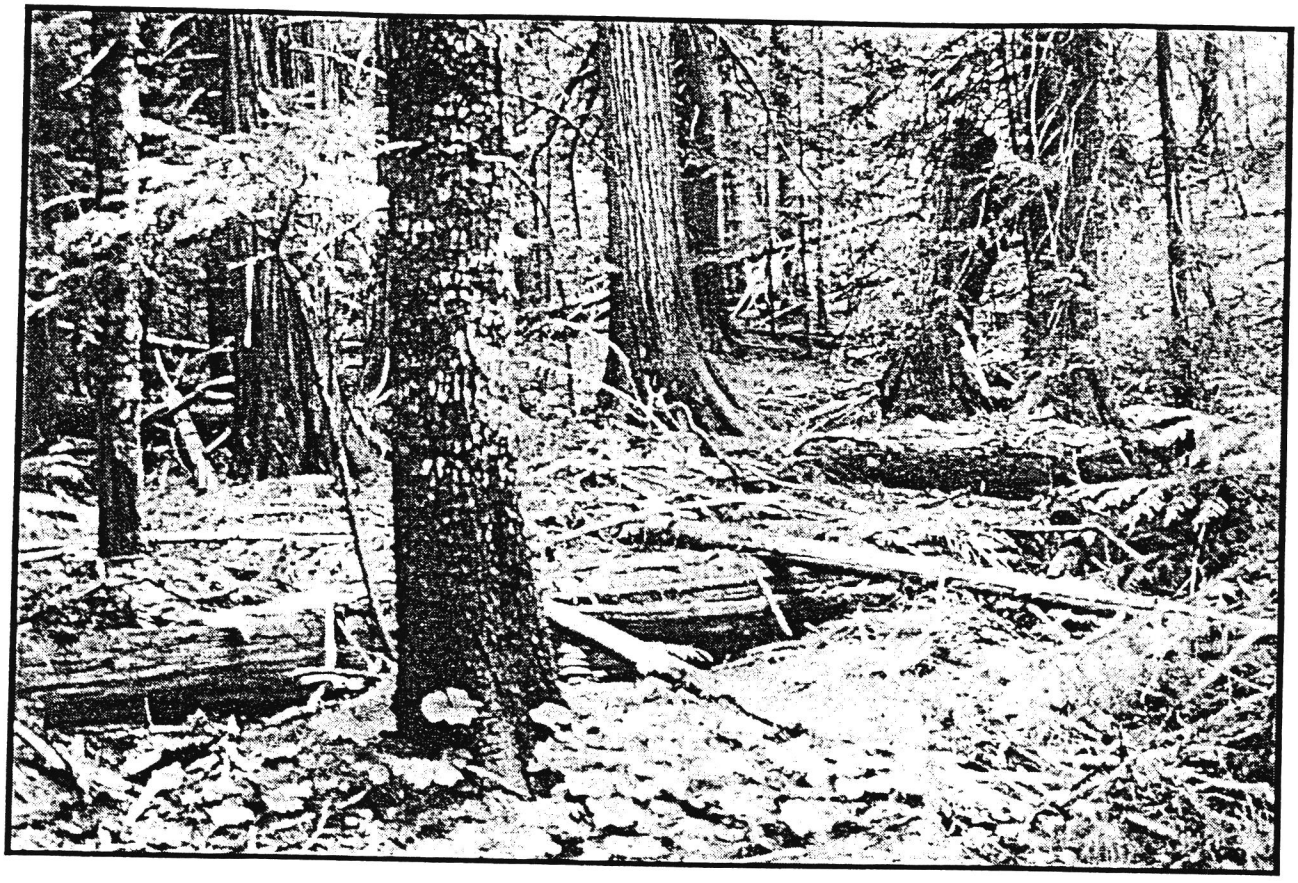
1. Indexed to age 100. References: Douglas-fir, McArdle et al. 1961; Western hemlock, Barnes 1962; Noble fir, Herman et al. 1978.
2. Hall 1980.
3. See discussion of Timber Productivity in Chapter 3 for references.
4. Methods after Hemstrom 1982.

The likelihood of cool temperatures should be taken into account when managing sites with this association. Frost could cause reforestation problems when clear cut unit design results in impeded cold air drainage. Silviculturists should consider using planting stock from the next highest elevation seed zone, particularly when this association is encountered at low elevations (< 2000 feet). Otherwise, these sites should be able to respond favorably to most normal management regimes.

Similar Associations

This association is somewhat similar to the other Alaska huckleberry dominated Western Hemlock Zone plant associations. The TSHE/RHMA-VAAL/COCA (Western hemlock/Rhododendron-Alaska huckleberry/Dogwood bunchberry) association has rhododendron as a dominant, and is less herb-rich than TSHE/VAAL/COCA. In TSHE/VAAL/OXOR (Western hemlock/Alaska huckleberry/Oxalis, the herb layer is dominated by Oxalis rather than dogwood bunchberry. It is more productive and occurs at lower elevations than TSHE/VAAL/COCA. The TSHE/VAAL-OPHO association (Western hemlock/Alaska huckleberry-Devil's club) has devil's club and oxalis, is far more productive and occupies wetter sites. Finally, the TSHE/VAAL-GASH (Western hemlock/Alaska huckleberry-Salal) association has more salal and is less herb-rich. it indicates sites of lower productivity, and generally occurs on steeper slopes.

Western redcedar-Grand fir/Vanillaleaf
Thuja plicata-Abies grandis/Achlys triphylla
THPL-ABGR/ACTR CCF2 11

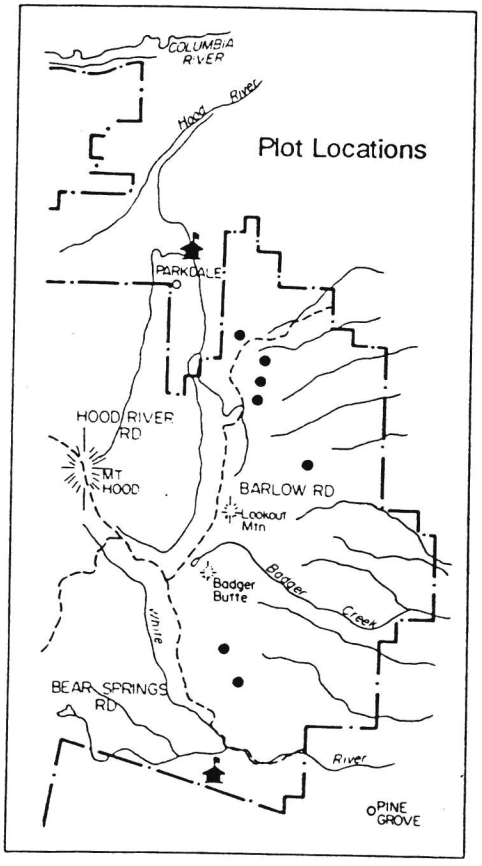


Environment and Distribution

This association occurs at moderate elevations (3000-3800 feet) near creeks and in shaded, lower slope positions. Our plots are mainly on Barlow Ranger District, but this grouping also exists on Hood River and Bear Springs Ranger Districts. The climate is warm and mesic, precipitation averaging 71 inches per year at our plots. Snow packs accumulate each year and help delay the period of summer soil moisture deficit. All slopes and aspects occur, although we found south aspects only at our higher elevation plot (3800 feet). The moist conditions (for the eastern Cascades) result from the high incident rainfall, the shaded conditions at lower slope positions, and the presence of fairly deep soils.

	Range	Average
Elevation (ft):	3180-3820	3563
Precipitation (in/yr):	53-85	71
Slope (%):	8-47	21

Number of Plots: 7 (intensive = 2)
Common Aspects: Variable



Vegetation: Structure and Composition

This association includes herb-rich mixed conifer stands having fairly low shrub cover. Either grand fir (ABGR) or Douglas-fir (PSME) dominate canopies. Western redcedar (THPL) is diagnostic for this association; its cover varies from a minor to major canopy constituent. It and grand fir are the most abundant seedling species. Other conifers present in small amounts are western larch (LAOC), western hemlock (TSHE), western white pine (PIMO), noble fir (ABPR), subalpine fir (ABLA2), and Engelmann spruce (PIEN). Ponderosa pine (PIPO) is nearly absent, although it may appear in an early seral role. Shrubs are not abundant. The common occurrence of bigleaf huckleberry (VAME) suggests cool, mesic conditions. Forbs dominate the understory. Most abundant are vanillaleaf (ACTR), twinflower (LIBO2), starry Solomonseal (SMST) and starflower (TRLA2). Dark-forest species are very abundant, including sidebells and whitevein pyrola (PYSE and PYPI), rattlesnake plantain (GOOB), and little and tall prince's pine (CHME and CHUM). Grasses are nearly absent.

Dominant Vegetation

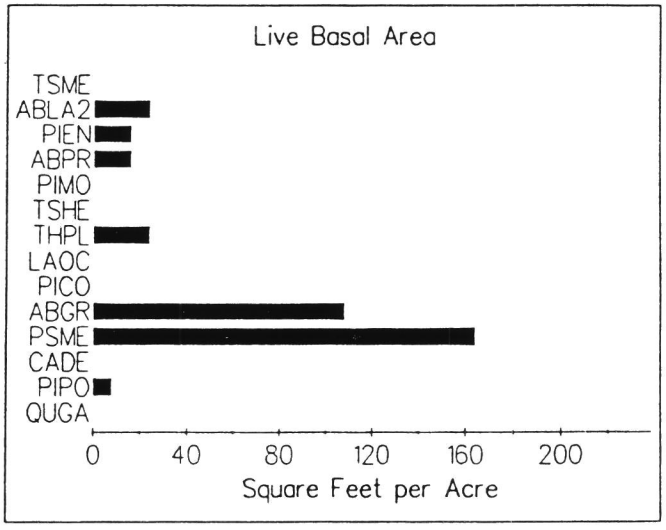
	Code	%Cov	Cons
Overstory Trees			
Grand fir	ABGR	32	100
Douglas-fir	PSME	22	100
Western redcedar	THPL	10	100
Western hemlock	TSHE	5	71
Western white pine	PIMO	11	42
Western larch	LAOC	3	42
Engelmann spruce	PIEN	1	42
Noble fir	ABPR	7	14
Understory Trees			
Western redcedar	THPL	5	85
Grand fir	ABGR	4	85
Western hemlock	TSHE	4	57
Shrubs			
Baldhip rose	ROGY	2	85
White spirea	SPBE	2	85
Snowberry	SYMPH	2	71
Dwarf oregongrape	BENE	1	71
Big huckleberry	VAME	1	71
Thimbleberry	RUPA	1	57
Forbs			
Vanillaleaf	ACTR	4	85
Twinflower	LIBO2	5	85
Star-flower	TRLA2	2	100
Starry solomonseal	SMST	2	85

Timber Productivity and Management

This association has moderate to good timber productivity. Stand stocking varies considerably, although live basal areas are usually high. Douglas-fir grow well; average site index (base age 100) on intensive plots was 119. Overall stand volume growth is enhanced by species mixtures which includes appreciable productivity of grand fir and western redcedar. The mesic environment typical for this association allows many timber harvest options. Clearcuts are easily regenerated with Douglas-fir and western larch. Shelterwoods should result in a greater species mix in future stands. Possible limitations to harvest activities result from the general proximity of sites with this association to streams and big-game migration trails. Pocket gophers may often destroy seedlings, especially on gentle sloped sites (< 30%).

Site Index				Growth Basal Area		10 yr. radial Grwth (in/10)	
species	base	mean	s.e.	mean	s.e.	mean	s.e.
PSME	100	108	21.5	308	68.4	10.4	5.6

Yield Capacity $ft^3/ac/yr$		SDI Growth Estimate $ft^3/ac/yr$		Trees per Acre #		Stand Density Index (SDI) trees/acre	
mean	s.e.	mean	s.e.	mean	s.e.	mean	s.e.
107	-	142	-	162	-	491	-



Wildlife and Range

Wildlife values are high in this association because of the thermal protection afforded by dense canopies, the abundance of quality forage, and because these sites are frequently near streams. Transitory range is excellent following timber harvest. Seeded grass, such as orchardgrass or smooth brome, will grow aggressively. Soil moisture should be adequate for young conifers unless the grass is heavily seeded or established before tree planting. Large Douglas-fir snags provide important nesting sites for many wildlife species.

Snags - Number/Acre				
Total/ Acre	20"+ DBH 50'+ Ht	20"+ DBH 30-49' Ht	13-19" DBH 30'+ Ht	10-12" DBH 10'+ Ht
18	6	0	11	0

Fuels Management

Fuel loadings on intensive plots were typical for the eastern Cascades. Various fuels treatments can be implemented. Large woody debris provides especially important wildlife habitat in sites having this association because of their frequent proximity to water courses. Careful use of machine slash-piling is required to avoid soil compaction, which adversely affects long-term site productivity.

Woody Debris > 3" Diameter				
Volume ft^3/acre	Weight ton/acre	Total #/acre	20"+ Dia. #/acre	12-19" Dia. #/acre
1036	12.0	176	0	4.5

Fine Fuels - Tons/Acre		
< 1/4" Diameter	1/4 - 1" Diameter	1.1 - 2.9" Diameter
0.85	3.00	4.72

Soils

Soils are typical for the eastern portion of the Mt. Hood National Forest. Fine sandy loam textured volcanic ash surface layers predominate on basalt parent materials. These soils are compactable, especially when moist. Soil moisture-holding properties are good.

Number of Soil Pits:	6
Effective Soil Depth (cm):	57
Soil Surface Texture:	Fine sandy loam
Parent Materials:	Ash on basalt

Similar Associations

This association is similar to ABGR/ACTR but is restricted to shaded lower slopes, usually near creeks. It occurs at much lower elevations than ABGR-PIEN/SMST, and has more western redcedar and much less western hemlock than TSHE-ABGR/CLUN. The THPL/LIBO2 community previously described on the Badger Allotment, Barlow RD, is very similar (Williams 1978). THPL/CLUN habitat types described in Idaho (Cooper and others 1987) and Montana (Pfister and others 1977) are slightly similar to this association.

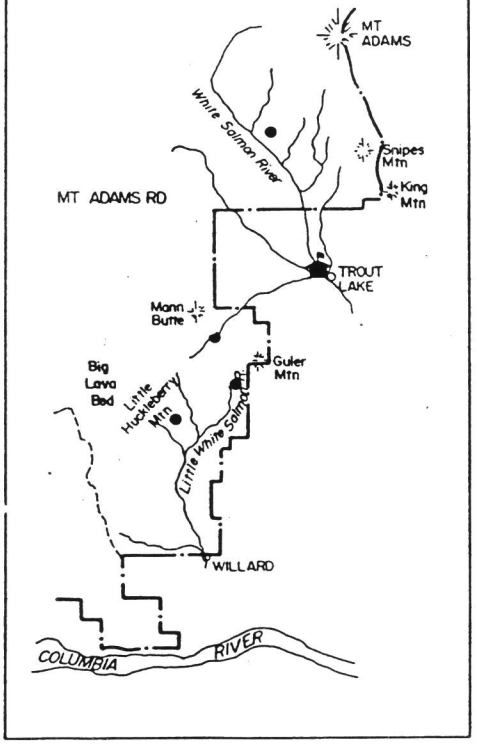
Western redcedar/Vanillaleaf
Thuja plicata/Achlys triphylla
THPL/ACTR CCF2 12

Environment and Distribution

Sites having this association are found at fairly low elevations transitional to either Western Hemlock or Grand Fir Series vegetation. It occupies a fairly restricted area near valley bottoms in the Little White Salmon River drainage, Cave Creek and along the White Salmon River. The environment is fairly moist for the east slope of the Cascades. Evaporative demand is probably low because of the shaded, lower slope positions. The temperature regime is also moderate for this area. Although snow may accumu-

	Range	Average
Elevation (ft):	2400-3300	2909
Precipitation (in/yr):	58-86	68
Slope (%):	0-54	23
Number of Plots:	4 (Intensive = 4)	
Common Aspects:	North and east	
Topographic Positions:	Middle slopes to valley bottoms	

Plot Locations



THPL/ACTR

Wildlife, Range and Fuels

Mature stands in this association have high floristic diversity providing a great variety of structures and food for wildlife. Most sites are important winter range and have excellent thermal and hiding cover habitat. Besides having valuable site attributes, most stands are situated along major streams and so play a major role in providing safe migratory habitat. Clearcuts will rapidly revegetate with many palatable shrubs including vine maple, blue elderberry, currants, and blackberry where cool burns or no slash burning occurs. Seeding legumes and grasses can enhance transitory winter range for elk without unduly risking plantation establishment success. Low forage palatability in mature stands suggests that such stands are non-range for livestock. Our sample plots had abundant Grand fir, Douglas-fir and western redcedar snags which provide outstanding nesting and foraging habitat for a wide variety of animal species because these sites tend to be near streams. Similarly, down logs provide especially valuable herpetofauna habitat so fuels management should attempt to leave as much down woody debris on-site as possible.

Snags - Number/Acre n = 4					
Total/ Acre	Condition Class				
	1	2	3	4	5
26	12	2	8	4	0

Soils

Soils in this association are moderately deep and generally have low rock content. Surface horizons are predominantly weathered ash which is compactable when wet. It also appears to be good habitat for pocket gophers. Protecting the forest floor (duff) and large woody debris is important to maintain nutrients on-site and maintain the important ecosystem functions of these materials.

Number of Soil Pits:	4
Efective Soil Depth (cm):	72
Soil SurfaceTexture:	Coarse sandy loam, loam or silt loam
Parent Materials:	Basalt mixed with weathered ash

Similar Associations

This association is distinguished by its high abundance of western redcedar as well as some western hemlock. The understory is very diverse and includes more consistent, substantial amounts of mesic-site herbs (eg. coolwort foamflower, fairybells, 3-leaved anemone, and vanillaleaf) than most of the Grand Fir Series associations. The ABGR-THPL/ACTR association on the eastern portion of the Mt. Hood National Forest is similar, but has lower timber productivity, more Grand fir regeneration, and less western hemlock (Topik et al. 1988). The THPL/COCA association on the Yakima Reservation is also quite similar (John etal. 1988). Similar floristics and environments characterize the THPL/CLUN habitat types, CLUN phase described in Northern Idaho (Cooper et al. 1987) and Montana (Pfister et al. 1977).

late, sites having this association probably remain snow-free for much of the year.

Vegetation: Structure and Composition

The prominant feature of this association is the abundance of western redcedar in both the overstory and understory within mature forest stands. Douglas-fir and Grand fir dominate overstories. The presence of western hemlock and a little noble fir suggests that this association is transitional between the Western Hemlock and Pacific Silver Fir Series. Both the shrub and herb layers are usually fairly sparse. Occasional patches of vine maple (ACCI) are encountered, but other tall shrubs are usually absent. Most shrub layers consist of scattered baldhip rose (ROGY), creeping snowberry (SYMO) and dwarf Oregongrape (BENE). Vanillaleaf is the most prominant herb species; it is usually accompained by lesser amounts of starflower (TRLA2), trillium (TROV), 3-leaved anemone (ANDE) or fairybells (DIHO).

Dominant Vegetation

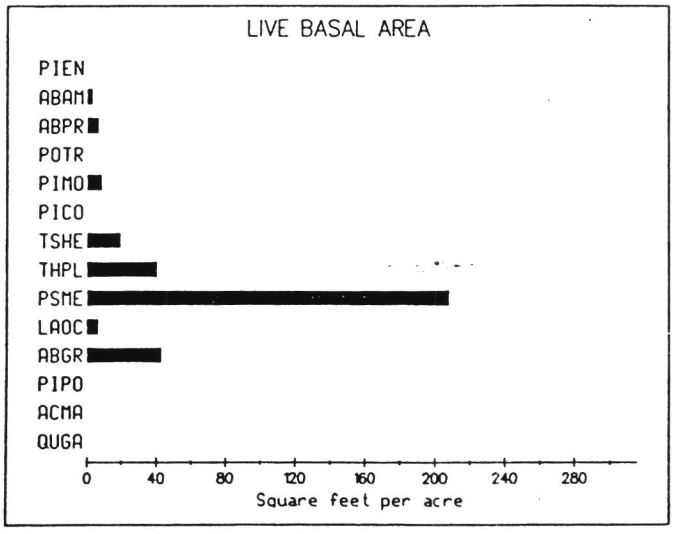
	Code	%Cov	Cons
Overstory Trees			
Douglas-fir	PSME	33	100
Grand fir	ABGR	23	100
Western redcedar	THPL	10	100
Western hemlock	TSHE	8	75
Western white pine	PIMO	10	25
Understory Trees			
Western redcedar	THPL	6	50
Western hemlock	TSHE	4	50
Grand fir	ABGR	3	25
Shrubs			
Vine maple	ACCI	8	75
Baldhip rose	ROGY	2	100
Dwarf Oregongrape	BENE	2	75
Creeping snowberry	SYMO	2	75
Forbs			
Vanillaleaf	ACTR	4	75
Fairy bells	DIHO	2	75
Starflower	TRLA2	2	100
Three-leaved anemone	ANDE	1	75
Pacific trillium	TROV	2	75

Timber Productivity and Management

Timber management in this association needs to consider the especially diverse tree populations as well as the common occurrence of sites near streams or in important winter range areas. Timber productivity is fair compared to the Grand Fir Zone, but our sample plots are very well stocked with large, old trees. Many of these sites offer excellent potential for uneven-aged management using group selection techniques. Such silviculture will result in minor disruptions to wildlife winter range and thermal cover needs and also assure the continual production of western redcedar, a high value timberspecies. Because some sites in this association have elevated water tables, heavy machinery should be used with caution, especially in winter and spring. This association offers an important opportunity to maintain the natural diversity of tree species on the Gifford Pinchot National Forest. Western redcedar and western larch should be encouraged in plantations, either by planting or leaving seed-trees. Large created openings may result in frost pockets because of the prevalence of this association in valley bottoms where cold air accumulates.

Site Index				Growth Basal Area		10 yr. radial Grwth (in/10)	
species	base	mean	s.e.	mean	s.e.	mean	s.e.
PSME	100	115	10	425	46	11	2
ABGR	100	71	4	368	4	9	3

Yield Capacity $ft^3/ac/yr$		SDI Growth Estimate $ft^3/ac/yr$		Trees per Acre #		Stand Density Index (SDI) trees/acre	
mean	s.e.	mean	s.e.	mean	s.e.	mean	s.e.
131	17	171	26	400	180	571	107



THPL/ACTR

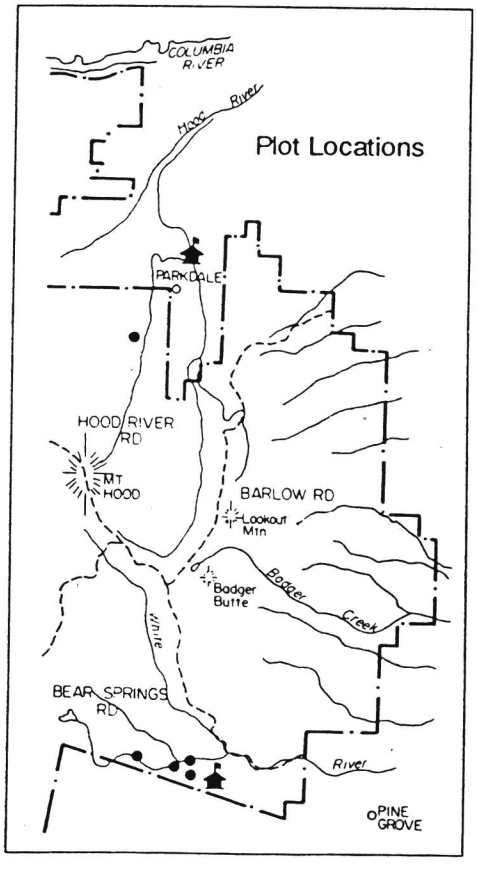
Western hemlock-Grand fir/Queencup Beadlily
Tsuga heterophylla-Abies grandis/Clintonia uniflora
TSHE-ABGR/CLUN CHC3 11

Environment and Distribution

This association occurs at low elevations on the Mt. Hood National Forest east of the Cascade Crest. It occurs on Bear Springs and Hood River Ranger Districts, and on Barlow Ranger District in narrow bands near streams below 3200 feet in elevation. Sites having this association are generally near streams or in places where cool, moist air flows from above. These environments are moderated by the lower solar input found in canyons as well as the greater soil moisture characteristic of lower slope positions. Annual precipitation is high (53) considering the low elevations.

	Range	Average
Elevation (ft):	2600-3300	3080
Precipitation (in/yr):	41-87	53
Slope (%):	2-40	16

Number of Plots:	5 (intensive = 3)
Common Aspects:	Variable
Topographic Positions:	Lower slopes



Vegetation: Structure and Composition

This association includes herb-rich mixed conifer stands having mature and regenerating western hemlock. Canopies are Douglas-fir (PSME) and grand fir (ABGR) dominated. Substantial cover (up to 20%) of western hemlock (TSHE) is common. Other conifers present include western redcedar (THPL), Pacific yew (TABR), western larch (LAOC), and ponderosa pine (PIPO). Our sample plots were more often in older age classes (150 years) than the grand fir series associations. The low wildfire risk is probably caused by the generally moist conditions. Dense understories of dwarf Oregongrape (BENE), vine maple (ACCI) and baldhip rose (ROGY) abound. Creeping snowberry (SYMO) is usually present and may become abundant where ground disturbance has occurred in mature stands. The forb layer is densely populated with a variety of species characteristic of mesic eastside conditions: twinflower (LIBO2), vanillaleaf (ACTR), starry Solomonseal (SMST), and queencup beadlily (CLUN). Other herbs occurring characteristic of moist stands include violets (pioneer (VIGL) and redwoods (VISE)) and dogwood bunchberry (COCA).

Dominant Vegetation

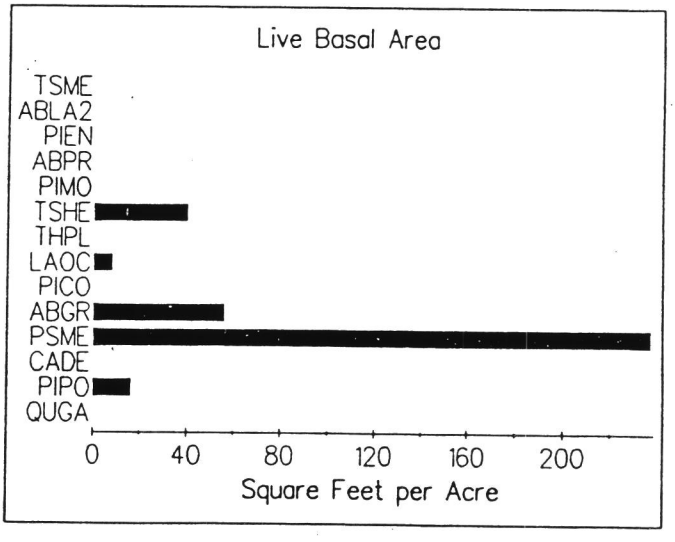
	Code	%Cov	Cons
Overstory Trees			
Douglas-fir	PSME	35	100
Grand fir	ABGR	22	100
Western hemlock	TSHE	15	80
Western redcedar	THPL	10	20
Ponderosa pine	PIPO	3	20
Western larch	LAOC	3	20
Understory Trees			
Grand fir	ABGR	8	80
Western hemlock	TSHE	5	80
Shrubs			
Dwarf oregongrape	BENE	16	100
Vine maple	ACCI	18	80
Prince's pine	CHUM	7	100
Snowberry	SYMPH	4	100
Baldhip rose	ROGY	2	100
Forbs			
Twinflower	LIBO2	14	100
Vanillaleaf	ACTR	8	100
Queencup beadlilly	CLUN	6	80
Starry solomonseal	SMST	2	100
Rattlesnake plaintain	GOOB	1	100
Star-flower	TRLA2	2	80
Sidebells pyrola	PYSE	1	80

Timber Productivity and Management

Timber productivity in this association is moderate. Both height growth and stocking are about the same as the grand fir series associations. Average stand diameter on intensive plots was 18.8 inches, much higher than for grand fir zone associations. Stands are dominated by fairly even-aged, large Douglas-fir with younger grand fir growing up from below. Sites in this association will respond favorably to both clearcuts and shelterwood harvests. Regeneration of Douglas-fir is appropriate: natural regeneration of Douglas-fir in shelterwoods should commonly be successful if Douglas-fir are left as seed trees. Western larch, though not abundant in natural stands, is an excellent choice as seed trees in shelterwoods. A possible limitation to the use of clearcuts is the common occurrence of this association adjacent to riparian areas and in critical big game migration routes.

Site Index				Growth Basal Area		10 yr. radial Grwth (in/10)	
species	base	mean	s.e.	mean	s.e.	mean	s.e.
PIPO	100	113	-	224	-	2.0	-
PSME	100	106	8.2	295	21.4	7.3	0.2
ABGR	50	68	-	289	-	8.0	-

Yield Capacity $ft^3/ac/yr$		SDI Growth Estimate $ft^3/ac/yr$		Trees per Acre #		Stand Density Index (SDI) trees/acre	
mean	s.e.	mean	s.e.	mean	s.e.	mean	s.e.
97	6.2	110	7.2	181	38.9	462	31.2



Wildlife and Range

Stands in this association offer excellent thermal cover and abundant browse and forage for big game. Large snags, providing excellent cavity nesting habitat, are common because of the characteristic good tree growth and low wildfire risk. Yet, most of the large snags (> 20 in. DBH) on intensive plots were grand fir, a species with low wildlife value and persistence. Many sites with this association provide key habitats linking winter range with summer foraging areas. Transitory range for both wildlife and cattle are excellent. Grasses, such as orchardgrass or smooth brome, seeded on disturbed soils will grow well so light seeding (2 lbs./acre) is appropriate. Competition for moisture between seeded grass and young conifers should generally not be severe. Pocket gophers will likely be abundant in plantations where slopes are gentle (< 30%).

Snags - Number/Acre				
Total/ Acre	20"+ DBH 50'+ Ht	20"+ DBH 30-49' Ht	13-19" DBH 30'+ Ht	10-12" DBH 10'+ Ht
44	3	4	19	17

Fuels Management

Fuel loadings on our intensive plots were more than twice as high as those measured in any grand fir series association. The majority of this extra woody material is large logs. This heavy loading results from the lack of wildfires characteristic for sites comprising this association. The abundance of large material provides important habitat for many animals which is usually not far from streams. Various fuels treatments can be implemented without eliminating this valuable, large woody debris.

Woody Debris > 3" Diameter				
Volume ft^3/acre	Weight ton/acre	Total # /acre	20"+ Dia. # /acre	12-19" Dia. # /acre
3685	35.7	508	29.3	51.3

Fine Fuels - Tons/Acre		
< 1/4" Diameter	1/4 - 1" Diameter	1.1 - 2.9" Diameter
0.52	0.96	2.52

Soils

Soil moisture regimes are strongly affected by the lower slope positions and shaded microsites characteristic of this association. Physical properties are typical for this area, dominated by fine sandy loam textured surface layers of volcanic ash or breccia on basalt parent materials. Soil compaction occurs readily, especially because soils remain moist longer than most eastside locales.

Number of Soil Pits:	4
Effective Soil Depth (cm):	53
Soil Surface Texture:	Fine sandy loam
Parent Materials:	Breccia on basalt, or ash on basalt

Similar Associations

Stand structure and floristics are fairly similar to associations found west of the Cascade crest (such as TSHE/BENE), except for the abundance of grand fir and some characteristic eastside understory species (eg. creeping hollygrape (BERE) and Oregon anemone (ANOR)). Except for having much more grand fir, this association is similar to both TSHE/LIBO2, described for the Badger Allotment (Williams 1978), and TSHE/ACCI on Warm Springs Indian Reservation (Marsh 1985). TSHE/CLUN habitat types in Idaho (Cooper and others 1987) and Montana (Pfister and others 1977) are similar to this association.

APPENDIX D

PERCENT COVER AND CONSTANCY OF SELECTED PLANT SPECIES BY RIPARIAN TYPE

CONIFER FOREST TYPES - COVER AND CONSTANCY

	ABGR-THPL/LYAM		THPL/ATFI-STCO4		THPL/RUSP/OXOR	
	7 Plots		13 Plots		10 Plots	
Species	CON	%COV	CON	%COV	CON	%COV
MATURE TREES						
Abies grandis - mature	14	30	.	.	.	.
Acer macrophyllum - mature	.	.	8	10	.	.
Alnus rubra - mature	.	.	38	33	70	26
Picea engelmannii - mature	29	30	.	.	.	.
Pseudotsuga menziesii - mature	.	.	8	7	10	5
Thuja plicata - mature	43	40	85	27	100	37
Tsuga heterophylla - mature	.	.	8	15	20	5
REGEN TREES						
Abies amabilis - regen	.	.	15	2	.	.
Abies grandis - regen	71	9	31	1	.	.
Acer macrophyllum - regen	.	.	15	2	10	1
Alnus rubra - regen	.	.	46	8	10	12
Picea engelmannii - regen	43	7	.	.	.	.
Pseudotsuga mertensiana - regen	29	1	8	1	10	1
Taxus brevifolia - regen	43	3	15	8	.	.
Thuja plicata - regen	57	5	69	6	20	1
Tsuga heterophylla - regen	43	10	38	3	40	3
Tsuga mertsensiana - regen	14	5	.	.	.	.
SHRUBS						
Acer circinatum	.	.	31	15	30	7
Alnus incana	57	22	15	4	.	.
Amelanchier alnifolia	14	1	.	.	.	.
Berberis nervosa	14	1	23	2	.	.
Cornus stolonifera	29	1	.	.	.	.
Oemleria cerasiformis	.	.	15	6	10	1
Oplopanax horridum	.	.	15	3	40	3
Physocarpus capitatus	29	6	.	.	10	30
Ribes bracteosum	14	5	23	2	90	13
Ribes lacustre	.	.	69	9	10	1
Rosa gymnocarpa	29	2	46	2	.	.
Rubus parviflorus	14	1	15	6	10	2
Rubus spectabilis	.	.	31	9	90	18
Rubus ursinus	29	3	31	2	.	.
Symphoricarpos albus	14	2	23	1	.	.
Vaccinium ovalifolium	14	5	.	.	.	.
FORBS						
Achlys triphylla	14	2	31	4	.	.
Adiantum pedatum	.	.	23	2	20	2
Angelica arguta	29	2	23	1	20	1
Arnica amplexicaulis	14	3	.	.	.	.
Arnica cordifolia	.	.	8	25	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

CONIFER FOREST TYPES - COVER AND CONSTANCY - cont'd

Species	ABGR-THPL/LYAM 7 Plots CON	%COV	THPL/ATFI-STCO4 13 Plots CON	%COV	THPL/RUSP/OXOR 10 Plots CON	%COV
Athyrium filix-femina	71	15	69	8	90	8
Cardamine cordifolia	.	.	8	6	.	.
Circaea alpina	14	1	46	2	20	2
Cornus canadensis	14	10	.	.	.	.
Corydalis scouleri	.	.	.	.	60	23
Dodecatheon jeffreyi	14	15	.	.	.	.
Dryopteris austriaca	.	.	.	.	20	3
Epilobium alpinum	14	3	8	1	.	.
Epilobium glaberrimum	29	2	23	2	.	.
Epilobium luteum	.	.	15	3	.	.
Fragaria vesca	14	4	23	4	.	.
Galium triflorum	71	1	92	3	20	1
Gymnocarpium dryopteris	.	.	23	9	40	9
Heracleum lanatum	14	1	23	1	10	1
Hydrophyllum tenuipes	.	.	8	1	60	8
Linnaea borealis	29	6	38	5	.	.
Listera convallarioides	57	3	.	.	.	.
Lysichitum americanum	100	37	8	1	20	8
Mimulus guttatus	29	2	8	15	.	.
Montia sibirica	.	.	23	6	40	1
Oxalis oregana	.	.	.	.	100	22
Petasites frigidus	.	.	31	11	20	3
Polystichum munitum	.	.	38	7	80	8
Pteridium aquilinum	14	3	8	3	.	.
Saxifraga punctata	14	1	8	4	.	.
Senecio triangularis	71	4	31	5	.	.
Smilacina racemosa	.	.	23	7	20	1
Smilacina stellata	29	2	31	1	10	1
Stachys cooleyae	57	5	54	16	40	2
Streptopus amplexifolius	86	1	23	1	20	1
Tiarella trifoliata unifoliata	29	2	46	1	20	3
Tolmiea menziesii	.	.	15	13	60	2
Trautvetteria caroliniensis	.	.	23	7	.	.
Vicia americana	14	1	8	4	.	.
Viola glabella	43	1	54	2	20	19
Viola palustris	29	4	15	7	.	.
GRASSES, GRASSLIKES						
Carex laeviculmis	57	11	23	2	20	1
Carex lenticularis	14	20	.	.	.	.
Cinna latifolia	.	.	8	15	.	.
Elymus glaucus	.	.	.	.	10	2
Festuca subulata	.	.	23	8	10	1
Glyceria elata	43	2	.	.	.	.
Luzula parviflora	14	1	15	2	30	2
Scirpus microcarpus	29	8	15	8	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - PERCENT COVER AND CONSTANCY

Species	ALRU/ACCI 12 Plots CON	%COV	ALRU/ELGL 15 Plots CON	%COV	ALRU/OPHO 12 Plots CON	%COV	ALRU/OXALIS 14 Plots CON	%COV	ALRU/PEFR2 27 Plots CON	%COV
MATURE TREES										
Acer macrophyllum - mature	25	25	7	25	8	10	36	54	4	60
Alnus rubra - mature	92	44	87	61	100	43	71	59	63	45
Populus trichocarpa - mature	.	.	13	5	.	.	.	.	.	.
Pseudotsuga menziesii - mature	17	7	20	8	.	.	.	.	.	.
Thuja plicata - mature	.	.	.	.	17	12	.	.	.	.
Tsuga heterophylla - mature	.	.	7	5	33	9	7	2	4	1
REGEN TREES										
Abies amabilis - regen	.	.	.	.	.	.	.	.	4	10
Abies grandis - regen	.	.	.	.	.	.	.	.	7	2
Acer macrophyllum - regen	8	1	53	1	8	1	29	2	15	2
Alnus rubra - regen	33	6	33	48	33	2	29	13	70	21
Populus trichocarpa - regen	.	.	7	2	.	.	.	.	.	.
Pseudotsuga mertensiana - regen	8	1	53	4	.	.	7	3	7	18
Thuja plicata - regen	17	1	33	1	8	1	21	4	26	1
Tsuga heterophylla - regen	8	1	20	2	17	1	36	5	26	2
SHRUBS										
Acer circinatum	100	47	40	1	42	27	21	11	11	5
Alnus sinuata	.	.	.	.	.	.	.	.	4	10
Cornus stolonifera	17	6	.	.	17	18	.	.	.	.
Holodiscus discolor	.	.	27	1	.	.	7	2	4	5
Oemleria cerasiformis	25	2	27	2	.	.	36	2	.	.
Oplopanax horridum	17	3	.	.	100	31	21	2	19	3
Ribes bracteosum	.	.	20	9	75	19	14	3	33	19
Ribes lacustre	.	.	47	2	.	.	7	1	26	1
Rosa gymnocarpa	8	1	.	.	8	1	.	.	4	1
Rubus parviflorus	33	7	13	4	25	2	14	2	22	7
Rubus spectabilis	33	9	60	3	75	6	57	2	59	3
Rubus ursinus	33	9	67	8	8	3	43	14	26	6
Salix sitchensis	17	5	27	8	.	.	.	.	19	13
Sambucus racemosa	8	1	13	4	17	1	43	4	4	15
Symphoricarpos albus	25	19	7	1	.	.	.	.	.	.
Vaccinium alaskaense	.	.	.	.	17	5	.	.	4	30
Vaccinium ovalifolium	.	.	.	.	8	10	.	.	.	.
Vaccinium parvifolium	8	1	13	2	17	3	14	1	7	2
Viburnum edule	17	17	.	.	.	.	.	.	4	5
FORBS										
Achlys triphylla	17	9	7	10	17	1	.	.	11	6
Adenocaulon bicolor	8	2	.	.	.	.	21	1	4	1
Adiantum pedatum	17	1	13	1	17	6	14	3	22	1
Anaphalis margaritacea	8	1	.	.	.	.	7	1	7	1
Anemone deltoidea	.	.	7	1	.	.	.	.	7	1

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - PERCENT COVER AND CONSTANCY - cont'd

Species	ALRU/ACCI 12 Plots		ALRU/ELGL 15 Plots		ALRU/OPHO 12 Plots		ALRU/OXALIS 14 Plots		ALRU/PEFR2 27 Plots	
	CON	%COV	CON	%COV	CON	%COV	CON	%COV	CON	%COV
Angelica arguta	.	.	13	1	25	2	21	1	22	2
Aquilegia formosa	.	.	7	1	.	.	.	.	4	1
Aruncus sylvester	8	5	20	2	8	2	7	1	19	2
Asarum caudatum	17	2	.	.	8	1	14	1	15	2
Aster modestus	8	2	13	3	.	.	.	.	15	1
Athyrium filix-femina	58	2	47	1	58	5	71	11	63	9
Cimicifuga laciniata	.	.	.	.	25	9	.	.	4	18
Circaea alpina	33	5	.	.	33	8	29	9	37	1
Cornus canadensis	.	.	.	.	8	1	.	.	7	8
Corydalis aquae-gelidae	.	.	.	.	.	.	7	1	.	.
Corydalis scouleri	17	4	.	.	.	.	36	34	4	1
Dicentra formosa	33	5	7	7	50	2	29	1	11	1
Digitalis purpurea	.	.	33	2	.	.	7	1	4	2
Dryopteris austriaca	.	.	.	.	8	5	29	6	7	2
Epilobium angustifolium	.	.	.	.	8	2	.	.	4	1
Epilobium glaberrimum	8	1	13	1	.	.	.	.	30	1
Equisetum arvense	.	.	33	2	8	1	.	.	26	6
Fragaria vesca	.	.	27	1	.	.	.	.	7	1
Galium aparine	8	5	.	.	8	1	.	.	.	.
Galium oreganum	.	.	.	.	.	.	14	4	7	20
Galium triflorum	25	8	40	2	58	1	64	1	70	2
Geum macrophyllum	.	.	.	.	.	.	.	.	7	1
Gymnocarpium dryopteris	.	.	7	1	25	1	7	1	11	3
Heracleum lanatum	17	1	20	3	8	2	7	1	26	1
Heuchera micrantha	17	1	7	1	.	.	.	.	4	1
Hydrophyllum tenuipes	25	2	.	.	25	10	29	5	11	1
Hypericum perforatum	.	.	.	.	.	.	.	.	4	1
Lactuca muralis	58	2	87	3	25	1	64	1	30	1
Lotus purshianus	.	.	.	.	.	.	.	.	.	.
Lysichitum americanum	8	1	.	.	8	15	7	2	11	4
Maianthemum dilatatum	8	1	7	1	.	.	14	16	.	.
Mimulus guttatus	8	1	.	.	.	.	.	.	26	3
Mitella breweri	17	1	7	1	17	1	14	2	4	1
Mitella pentandra	.	.	.	.	.	.	.	.	4	15
Montia parvifolia	25	1	20	6	8	1	7	2	22	2
Montia sibirica	67	12	73	9	50	2	79	2	52	4
Oenanthe sarmentosa	.	.	.	.	17	1	.	.	11	4
Osmorhiza chilensis	33	1	27	1	8	1	14	1	26	1
Oxalis oregana	42	7	7	15	50	18	71	28	30	3
Oxalis trilliifolia	.	.	.	.	17	14	29	31	11	9
Parnassia fimbriata	.	.	.	.	.	.	.	.	4	1
Petasites frigidus	17	1	27	2	33	2	36	3	100	25
Polypodium glycyrrhiza	.	.	13	1	17	1	14	1	.	.
Polystichum munitum	75	2	80	4	50	4	86	15	22	3
Pteridium aquilinum	17	8	.	.	17	4	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - PERCENT COVER AND CONSTANCY

Species	ALRU/ACCI 12 Plots CON	%COV	ALRU/ELGL 15 Plots CON	%COV	ALRU/OPHO 12 Plots CON	%COV	ALRU/OXALIS 14 Plots CON	%COV	ALRU/PEFR2 27 Plots CON	%COV
Ranunculus uncinatus	.	.	.	.	.	.	.	.	4	1
Senecio triangularis	.	.	.	.	8	2	7	1	15	1
Smilacina racemosa	8	1	7	2	.	.	.	.	4	5
Smilacina stellata	17	3	27	1	17	1	7	3	7	4
Stachys cooleyae	67	4	40	2	42	3	21	4	59	6
Stellaria crispa	.	.	13	3	.	.	7	1	7	1
Streptopus amplexifolius	.	.	.	.	33	2	.	.	4	1
Tiarella trifoliata unifoliata	8	4	13	2	25	1	29	1	30	1
Tolmiea menziesii	50	2	47	5	58	19	50	10	63	7
Trautvetteria caroliniensis	17	1	.	.	.	.	.	.	7	1
Trifolium arvense	.	.	.	.	.	.	.	.	.	.
Trifolium pratense	.	.	.	.	.	.	.	.	.	.
Trillium ovatum	8	1	.	.	25	1	.	.	4	1
Urtica dioica	8	10	7	1	8	3	21	12	4	1
Valeriana sitchensis	8	1	.	.	.	.	.	.	.	.
Vancouveria hexandra	8	20	13	1	17	5	14	13	4	2
Veronica americana	.	.	.	.	.	.	7	1	4	1
Veratrum viride	8	1	.	.	8	2	.	.	4	1
Viola glabella	25	5	.	.	.	.	14	5	30	3
Viola spp.	.	.	7	1	8	1	7	3	4	5
Viola palustris	.	.	.	.	.	.	.	.	7	1
GRASSES, GRASSLIKES										
Agrostis thurberiana	.	.	.	.	8	1	.	.	.	.
Anthoxanthum odoratum	8	1	7	75	.	.	7	3	.	.
Bromus vulgaris	25	9	13	5	25	4	29	7	22	8
Carex deweyana	.	.	7	1	.	.	21	4	7	1
Carex laeviculmis	25	1	27	1	25	1	14	2	15	2
Carex lenticularis	.	.	.	.	.	.	.	.	4	1
Carex mertensii	.	.	7	1	.	.	.	.	.	.
Carex spp.	.	.	.	.	8	1	14	1	7	1
Cinna latifolia	.	.	.	.	.	.	.	.	30	3
Elymus glaucus	.	.	100	33	.	.	7	1	30	4
Festuca subulata	8	1	7	5	.	.	.	.	15	1
Glyceria elata	.	.	.	.	8	1	.	.	33	1
Holcus lanatus	.	.	7	5	.	.	7	3	.	.
Luzula parviflora	.	.	7	1	.	.	21	1	19	1
Poa palustris	.	.	20	13	8	1	.	.	.	.
Poa trivialis	.	.	7	10	.	.	7	1	.	.
Scirpus microcarpus	.	.	.	.	8	1	.	.	19	8
Trisetum cernuum	17	2	.	.	.	.	.	.	4	2
Unknown grass	33	3	7	10	33	2	36	5	15	1

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	ALRU/RUPA 9 Plots CON	%COV	ALRU/RUSP/OXALIS 36 Plots CON	%COV	ALRU/RUSP/TOME 30 Plots CON	%COV	ALRU/STCO4 18 Plots CON	%COV	ALRU/TOME-MOSI 14 Plots CON	%COV
MATURE TREES										
Acer macrophyllum - mature	11	80	14	14	20	20	.	.	36	24
Alnus rubra - mature	78	61	81	50	87	43	67	63	100	68
Populus trichocarpa - mature	.	.	3	5	.	.	.	.	.	.
Pseudotsuga menziesii - mature	33	4	6	6	.	.	.	.	7	1
Thuja plicata - mature	.	.	14	3	10	6	.	.	7	1
Tsuga heterophylla - mature	11	2	11	5	3	1	.	.	7	1
REGEN TREES										
Abies amabilis - regen	.	.	3	4	7	2	.	.	.	.
Abies grandis - regen	.	.	3	5	.	.	.	.	7	1
Acer macrophyllum - regen	11	1	39	6	7	2	22	7	36	22
Alnus rubra - regen	33	27	53	14	37	10	78	17	14	1
Populus trichocarpa - regen	.	.	3	15	.	.	.	.	.	.
Pseudotsuga mertensiana - regen	22	1	17	1	3	1	22	2	29	1
Thuja plicata - regen	56	1	22	2	10	1	17	1	21	1
Tsuga heterophylla - regen	33	12	25	1	17	2	28	1	43	2
SHRUBS										
Acer circinatum	11	1	22	5	20	12	11	4	43	2
Alnus sinuata	11	10	.	.	.	.	.	.	.	.
Cornus stolonifera	.	.	6	3	.	.	11	5	14	1
Holodiscus discolor	11	18	6	3	3	3	6	1	14	3
Oemleria cerasiformis	.	.	17	7	20	2	17	1	21	2
Oplopanax horridum	11	2	14	1	13	6	6	1	7	1
Ribes bracteosum	22	4	67	21	80	24	33	9	21	2
Ribes lacustre	44	2	25	1	17	2	28	2	14	1
Rosa gymnocarpa	.	.	6	18	3	1	11	1	.	.
Rubus parviflorus	100	39	36	13	27	13	33	3	43	4
Rubus spectabilis	67	4	94	24	97	35	44	3	71	4
Rubus ursinus	22	4	14	6	17	10	17	16	43	8
Salix sitchensis	22	9	8	4	3	5	6	2	7	1
Sambucus racemosa	.	.	25	7	30	9	6	1	14	8
Symphoricarpos albus	.	.	14	5	13	4	6	50	7	1
Vaccinium alaskaense	22	3	3	2	3	8	.	.	.	.
Vaccinium ovalifolium	.	.	8	4	10	1	.	.	.	.
Vaccinium parvifolium	22	6	11	1	7	4	6	1	.	.
Viburnum edule	.	.	3	2	3	5	.	.	.	.
FORBS										
Achlys triphylla	22	4	6	2	17	2	11	1	.	.
Adenocaulon bicolor	11	5	3	2	3	5	6	1	7	1
Adiantum pedatum	.	.	19	6	17	3	22	8	.	.
Anaphalis margaritacea	11	2	3	1	.	.	17	1	7	1
Anemone deltoidea	.	.	3	4	.	.	6	1	14	5

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	ALRU/RUPA 9 Plots CON	%COV	ALRU/RUSP/OXALIS 36 Plots CON	%COV	ALRU/RUSP/TOME 30 Plots CON	%COV	ALRU/STCO4 18 Plots CON	%COV	ALRU/TOME-MOSI 14 Plots CON	%COV
Angelica arguta	.	.	19	3	13	2	17	5	14	1
Aquilegia formosa	.	.	3	1	7	5	11	10	21	1
Aruncus sylvester	22	9	3	1	10	3	33	5	36	1
Asarum caudatum	22	13	6	1	3	2	11	1	14	1
Aster modestus	.	.	.	.	13	1	22	24	7	2
Athyrium filix-femina	33	2	67	6	73	9	50	5	43	8
Cimicifuga laciniata	.	.	.	.	.	.	.	.	7	2
Circaea alpina	11	2	56	3	40	7	44	4	43	6
Cornus canadensis	.	.	.	.	3	7	.	.	.	.
Corydalis aquae-gelidae	.	.	3	1	.	.	.	.	.	.
Corydalis scouleri	.	.	19	9	20	13	.	.	7	40
Dicentra formosa	22	1	31	3	27	2	6	2	43	1
Digitalis purpurea	.	.	3	1	.	.	.	.	7	1
Dryopteris austriaca	11	1	17	1	10	1	.	.	.	.
Epilobium angustifolium	11	1	3	2	.	.	.	.	.	.
Epilobium glaberrimum	22	1	3	3	7	1	17	1	21	1
Equisetum arvense	11	1	3	1	7	1	17	1	14	1
Fragaria vesca	.	.	3	1	.	.	11	1	7	12
Galium aparine	.	.	8	2	.	.	6	30	7	5
Galium oreganum	.	.	3	1	.	.	.	.	14	1
Galium triflorum	56	1	67	2	63	2	72	2	79	2
Geum macrophyllum	.	.	6	1	3	1	6	3	7	1
Gymnocarpium dryopteris	.	.	11	1	17	4	6	1	.	.
Heracleum lanatum	44	4	14	2	30	3	28	3	21	1
Heuchera micrantha	11	3	.	.	.	.	.	.	.	.
Hydrophyllum tenuipes	11	1	19	5	23	9	11	2	36	1
Hypericum perforatum	.	.	.	.	.	.	11	1	.	.
Lactuca muralis	22	1	39	1	23	4	39	6	64	8
Lotus purshianus	.	.	.	.	.	.	.	.	.	.
Lysichitum americanum	.	.	.	.	7	3	6	1	.	.
Maianthemum dilatatum	.	.	6	2	.	.	.	.	7	1
Mimulus guttatus	33	1	.	.	7	1	33	1	7	1
Mitella breweri	.	.	8	1	7	3	.	.	.	.
Mitella pentandra	.	.	3	15	10	15	.	.	.	.
Montia parvifolia	33	20	6	1	17	3	22	5	43	9
Montia sibirica	44	3	53	4	43	5	50	2	93	19
Oenanthe sarmentosa	.	.	11	3	7	1	6	3	7	1
Osmorhiza chilensis	33	2	14	1	7	1	17	1	14	1
Oxalis oregana	22	4	86	20	40	2	17	7	29	2
Oxalis trilliifolia	.	.	14	27	7	3	11	3	.	.
Parnassia fimbriata	11	1	.	.	.	.	.	.	.	.
Petasites frigidus	33	3	39	6	23	9	61	2	71	2
Polypodium glycyrrhiza	.	.	6	1	7	1	.	.	7	1
Polystichum munitum	33	5	69	5	50	5	33	3	50	5
Pteridium aquilinum	11	10	3	10	3	2	6	10	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	ALRU/RUPA ALRU/RUSP/OXALIS 9 Plots CON	%COV	36 Plots CON	%COV	ALRU/RUSP/TOME 30 Plots CON	%COV	ALRU/STCO4 18 Plots CON	%COV	ALRU/TOME-MOSI 14 Plots CON	%COV
Ranunculus uncinatus	11	1	3	1	7	1	6	1	.	.
Senecio triangularis	33	2	.	.	7	1	28	3	.	.
Smilacina racemosa	.	.	8	2	10	1	.	.	.	.
Smilacina stellata	11	2	11	1	7	3	11	1	.	.
Stachys cooleyae	67	11	69	3	63	3	83	16	64	3
Stellaria crispa	11	1	3	1	10	1	.	.	29	3
Streptopus amplexifolius	.	.	11	2	13	1	6	1	.	.
Tiarella trifoliata unifoliata	.	.	33	2	17	2	6	1	.	.
Tolmiea menziesii	44	4	69	13	83	14	56	1	86	26
Trautvetteria caroliniensis	56	2	6	1	3	1	6	1	7	1
Trifolium arvense	.	.	.	.	.	.	.	.	.	.
Trifolium pratense	.	.	.	.	.	.	.	.	.	.
Trillium ovatum	.	.	3	1	7	1	.	.	7	1
Urtica dioica	11	1	8	15	3	10	.	.	7	1
Valeriana sitchensis	22	16	3	40	3	12	11	1	.	.
Vancouveria hexandra	11	25	3	3	13	1	.	.	14	1
Veronica americana	11	1	.	.	.	.	.	.	7	1
Veratrum viride	.	.	.	.	.	.	.	.	.	.
Viola glabella	11	1	11	5	23	7	17	1	7	1
Viola spp.	11	1	8	17	3	5	6	1	.	.
Viola palustris	.	.	3	3	.	.	11	2	.	.
GRASSES, GRASSLIKES										
Agrostis thurberiana	.	.	.	.	.	.	.	.	.	.
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.
Bromus vulgaris	22	1	28	3	17	3	11	3	29	6
Carex deweyana	11	1	6	1	.	.	6	1	14	1
Carex laeviculmis	.	.	22	2	13	2	17	12	14	1
Carex lenticularis	.	.	.	.	.	.	6	1	.	.
Carex mertensii	.	.	3	1	3	1	6	1	7	1
Carex spp.	.	.	17	2	17	3	6	5	.	.
Cinna latifolia	11	2	6	4	3	3	6	3	7	4
Elymus glaucus	11	5	14	2	3	1	28	2	29	2
Festuca subulata	11	25	8	2	13	1	11	1	14	20
Glyceria elata	33	4	11	5	10	3	22	5	14	1
Holcus lanatus	.	.	3	1	.	.	.	.	.	.
Luzula parviflora	22	1	19	1	.	.	33	1	.	.
Poa palustris	.	.	3	1	3	1	11	1	.	.
Poa trivialis	11	1	.	.	3	1	.	.	.	.
Scirpus microcarpus	22	6	.	.	.	.	17	6	.	.
Trisetum cernuum	.	.	.	.	3	1	.	.	7	30
Unknown grass	22	3	25	2	20	4	22	7	21	5

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	POTR2 3 Plots CON	%COV
MATURE TREES		
Acer macrophyllum - mature	.	.
Alnus rubra - mature	33	1
Populus trichocarpa - mature	67	23
Pseudotsuga menziesii - mature	33	2
Thuja plicata - mature	.	.
Tsuga heterophylla - mature	.	.
REGEN TREES		
Abies amabilis - regen	.	.
Abies grandis - regen	.	.
Acer macrophyllum - regen	33	1
Alnus rubra - regen	33	1
Populus trichocarpa - regen	100	52
Pseudotsuga mertensiana - regen	100	8
Thuja plicata - regen	.	.
Tsuga heterophylla - regen	.	.
SHRUBS		
Acer circinatum	.	.
Alnus sinuata	.	.
Cornus stolonifera	.	.
Holodiscus discolor	.	.
Oemleria cerasiformis	.	.
Oplopanax horridum	.	.
Ribes bracteosum	.	.
Ribes lacustre	.	.
Rosa gymnocarpa	.	.
Rubus parviflorus	.	.
Rubus spectabilis	.	.
Rubus ursinus	.	.
Salix sitchensis	67	13
Sambucus racemosa	.	.
Symphoricarpos albus	.	.
Vaccinium alaskaense	.	.
Vaccinium ovalifolium	.	.
Vaccinium parvifolium	.	.
Viburnum edule	.	.
FORBS		
Achlys triphylla	.	.
Adenocaulon bicolor	.	.
Adiantum pedatum	.	.
Anaphalis margaritacea	100	1
Anemone deltoidea	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	POTR2 3 Plots CON	%COV
Angelica arguta	.	.
Aquilegia formosa	.	.
Aruncus sylvester	.	.
Asarum caudatum	.	.
Aster modestus	.	.
Athyrium filix-femina	.	.
Cimicifuga laciniata	.	.
Circaea alpina	.	.
Cornus canadensis	.	.
Corydalis aquae-gelidae	.	.
Corydalis scouleri	.	.
Dicentra formosa	.	.
Digitalis purpurea	.	.
Dryopteris austriaca	.	.
Epilobium angustifolium	.	.
Epilobium glaberrimum	33	1
Equisetum arvense	33	1
Fragaria vesca	.	.
Galium aparine	.	.
Galium oreganum	.	.
Galium triflorum	.	.
Geum macrophyllum	.	.
Gymnocarpium dryopteris	.	.
Heracleum lanatum	.	.
Heuchera micrantha	.	.
Hydrophyllum tenuipes	.	.
Hypericum perforatum	33	1
Lactuca muralis	33	3
Lotus purshianus	100	3
Lysichitum americanum	.	.
Maianthemum dilatatum	.	.
Mimulus guttatus	.	.
Mitella breweri	.	.
Mitella pentandra	.	.
Montia parvifolia	33	1
Montia sibirica	33	1
Oenanthe sarmentosa	.	.
Osmorhiza chilensis	.	.
Oxalis oregana	.	.
Oxalis trilliifolia	.	.
Parnassia fimbriata	.	.
Petasites frigidus	33	1
Polypodium glycyrrhiza	.	.
Polystichum munitum	.	.
Pteridium aquilinum	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HARDWOOD FOREST TYPES - COVER AND CONSTANCY

Species	POTR2 3 Plots CON	%COV
Ranunculus uncinatus	.	.
Senecio triangularis	.	.
Smilacina racemosa	.	.
Smilacina stellata	.	.
Stachys cooleyae	33	1
Stellaria crispa	.	.
Streptopus amplexifolius	.	.
Tiarella trifoliata unifoliata	.	.
Tolmiea menziesii	.	.
Trautvetteria caroliniensis	.	.
Trifolium arvense	33	1
Trifolium pratense	33	1
Trillium ovatum	.	.
Urtica dioica	.	.
Valeriana sitchensis	.	.
Vancouveria hexandra	.	.
Veronica americana	.	.
Veratrum viride	.	.
Viola glabella	.	.
Viola spp.	.	.
Viola palustris	.	.
GRASSES, GRASSLIKES		
Agrostis thurberiana	.	.
Anthoxanthum odoratum	33	1
Bromus vulgaris	.	.
Carex deweyana	.	.
Carex laeviculmis	.	.
Carex lenticularis	.	.
Carex mertensii	.	.
Carex spp.	.	.
Cinna latifolia	.	.
Elymus glaucus	67	1
Festuca subulata	.	.
Glyceria elata	.	.
Holcus lanatus	67	1
Luzula parviflora	.	.
Poa palustris	33	1
Poa trivialis	.	.
Scirpus microcarpus	.	.
Trisetum cernuum	.	.
Unknown grass	.	.

CON = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ACCI 4 Plots CON	%COV	ACCI-ALIN 5 Plots CON	%COV	ACCI/STCO4 11 Plots CON	%COV	ALIN-VAOV 6 Plots CON	%COV
MATURE TREES								
Abies amabilis - mature	.	.	.	.	.	.	.	.
Alnus rubra - mature	.	.	.	.	.	.	.	.
Picea engelmannii - mature	.	.	.	.	.	.	33	10
REGEN TREES								
Abies amabilis - regen	.	.	.	.	.	.	33	2
Populus trichocarpa - regen	.	.	.	.	.	.	.	.
Pseudotsuga mertensiana - regen	.	.	60	1	9	2	.	.
Taxus brevifolia - regen	25	40	.	.	.	.	.	.
Thuja plicata - regen	.	.	.	.	18	5	.	.
Tsuga heterophylla - regen	50	3	.	.	18	4	.	.
Tsuga mertsensiana - regen	.	.	.	.	.	.	17	2
SHRUBS								
Acer circinatum	100	49	100	51	91	62	.	.
Alnus incana	.	.	100	16	.	.	100	36
Alnus rubra	.	.	.	.	27	10	.	.
Alnus sinuata	.	.	.	.	.	.	.	.
Berberis nervosa	50	3	.	.	9	1	.	.
Cornus stolonifera	.	.	.	.	9	1	.	.
Lonicera involucrata	.	.	.	.	.	.	17	5
Menziesia ferruginea	.	.	.	.	.	.	.	.
Oplopanax horridum	.	.	.	.	45	5	.	.
Pachistima myrsinites	.	.	.	.	.	.	.	.
Physocarpus capitatus	.	.	60	39	.	.	17	8
Ribes bracteosum	50	5	.	.	18	18	33	4
Ribes lacustre	25	40	20	10	27	4	50	11
Rosa gymnocarpa	.	.	20	1	9	10	.	.
Rubus parviflorus	50	8	40	2	18	18	.	.
Rubus pedatus	.	.	.	.	.	.	.	.
Rubus spectabilis	25	1	20	5	55	3	67	8
Rubus ursinus	.	.	80	6	18	1	.	.
Salix sitchensis	.	.	.	.	.	.	.	.
Sorbus sitchensis	25	10	.	.	.	.	.	.
Spiraea douglasii	.	.	.	.	.	.	33	20
Symphoricarpos albus	.	.	20	1	9	10	.	.
Vaccinium alaskaense	.	.	.	.	.	.	.	.
Vaccinium deliciosum	25	1	.	.	.	.	.	.
Vaccinium membranaceum	.	.	.	.	.	.	17	1
Vaccinium ovalifolium	.	.	.	.	.	.	100	15
Viburnum edule	.	.	.	.	.	.	33	6
FORBS								
Achlys triphylla	75	1	20	1	27	1	100	5

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ACCI 4 Plots CON	%COV	ACCI-ALIN 5 Plots CON	%COV	ACCI/STCO4 11 Plots CON	%COV	ALIN-VAOV 6 Plots CON	%COV
Adiantum pedatum	25	1	.	.	45	3	.	.
Anaphalis margaritacea	.	.	.	.	9	1	.	.
Angelica arguta	.	.	.	.	9	1	.	.
Arnica latifolia	.	.	.	.	.	.	17	2
Aruncus sylvester	.	.	.	.	27	3	.	.
Asarum caudatum	.	.	20	2	18	6	17	1
Athyrium filix-femina	.	.	20	1	82	5	50	2
Blechnum spicant	.	.	.	.	18	3	.	.
Boykinia major	.	.	.	.	.	.	17	4
Circaea alpina	.	.	100	2	18	1	.	.
Cirsium arvense	.	.	.	.	.	.	.	.
Clintonia uniflora	.	.	.	.	9	1	17	7
Cornus canadensis	25	5	.	.	.	.	50	5
Corydalis aquae-gelidae	.	.	.	.	.	.	17	5
Corydalis scouleri	.	.	.	.	.	.	.	.
Epilobium angustifolium	.	.	20	1	.	.	.	.
Epilobium glaberrimum	.	.	.	.	9	1	.	.
Equisetum arvense	.	.	20	1	.	.	.	.
Fragaria vesca	.	.	80	1	.	.	.	.
Galium aparine	.	.	.	.	.	.	.	.
Galium oreganum	.	.	.	.	9	1	.	.
Galium triflorum	25	5	100	2	64	1	17	1
Gymnocarpium dryopteris	.	.	.	.	45	3	83	5
Heracleum lanatum	.	.	.	.	.	.	17	6
Hieracium albiflorum	25	1	20	1	.	.	.	.
Hydrophyllum tenuipes	.	.	.	.	18	8	.	.
Hypericum perforatum	.	.	40	1	.	.	.	.
Lactuca muralis	25	1	.	.	27	1	.	.
Linnaea borealis	50	3	.	.	.	.	.	.
Lotus corniculatus	.	.	.	.	.	.	.	.
Lysichitum americanum	.	.	.	.	.	.	50	4
Mimulus guttatus	.	.	.	.	9	2	17	1
Mitella breweri	.	.	.	.	.	.	.	.
Montia cordifolia	.	.	.	.	.	.	.	.
Montia parvifolia	.	.	.	.	18	12	.	.
Montia sibirica	.	.	.	.	36	5	17	1
Oenanthe sarmentosa	.	.	.	.	9	1	.	.
Osmorhiza chilensis	.	.	60	2	18	5	.	.
Oxalis oregana	.	.	.	.	27	19	.	.
Oxalis trilliifolia	.	.	.	.	9	25	.	.
Parnassia fimbriata	.	.	.	.	.	.	.	.
Petasites frigidus	.	.	.	.	36	4	.	.
Polystichum munitum	25	1	.	.	55	4	.	.
Senecio triangularis	.	.	20	1	18	1	33	5
Smilacina racemosa	.	.	20	2	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ACCI 4 Plots CON	%COV	ACCI-ALIN 5 Plots CON	%COV	ACCI/STCO4 11 Plots CON	%COV	ALIN-VAOV 6 Plots CON	%COV
Smilacina stellata	.	.	.	.	18	2	.	.
Stachys cooleyae	.	.	40	5	82	5	33	9
Stellaria crispa	.	.	20	1	9	1	.	.
Streptopus amplexifolius	25	1	.	.	18	1	50	3
Streptopus roseus	.	.	.	.	.	.	50	5
Thalictrum occidentale	.	.	.	.	.	.	17	1
Tiarella trifoliata unifoliata	.	.	.	.	36	7	50	4
Tolmiea menziesii	.	.	.	.	64	17	17	1
Trautvetteria caroliniensis	.	.	.	.	9	15	17	12
Trientalis latifolia	25	5	80	4	.	.	.	.
Trillium ovatum	.	.	.	.	9	1	.	.
Urtica dioica	.	.	.	.	.	.	.	.
Valeriana sitchensis	.	.	.	.	.	.	17	1
Vancouveria hexandra	.	.	.	.	9	1	17	4
Veratrum viride	.	.	.	.	.	.	.	.
Veronica americana	.	.	20	1	.	.	.	.
Viola glabella	.	.	60	1	27	1	17	5
GRASSES, GRASSLIKES								
Bromus vulgaris	.	.	20	3	.	.	.	.
Carex laeviculmis	.	.	20	1	9	1	.	.
Carex lenticularis	.	.	.	.	.	.	.	.
Carex spp.	.	.	20	1	9	1	.	.
Cinna latifolia	.	.	20	3	.	.	.	.
Deschampsia elongata	.	.	.	.	.	.	.	.
Elymus glaucus	.	.	.	.	18	1	.	.
Festuca subulata	.	.	20	2	9	1	.	.
Glyceria elata	.	.	40	1	9	1	33	3
Luzula parviflora	25	1	.	.	.	.	.	.
Phalaris arundinacea	.	.	.	.	.	.	.	.
Scirpus microcarpus	.	.	.	.	.	.	.	.
Unknown grass	.	.	.	.	45	3	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ALRU (SHRUB)/TRCA3 11 Plots CON	%COV	ALRU(SHRUB) 9 Plots CON	%COV	ALSI 21 Plots CON	%COV	COST 14 Plots CON	%COV
MATURE TREES								
Abies amabilis - mature	18	18	.	.	19	14	.	.
Alnus rubra - mature	9	80	11	40	.	.	7	90
Picea engelmannii - mature	.	.	.	.	.	.	.	.
REGEN TREES								
Abies amabilis - regen	18	4	.	.	33	10	.	.
Populus trichocarpa - regen	.	.	22	1	.	.	.	.
Pseudotsuga mertensiana - regen	.	.	44	1	5	1	7	3
Taxus brevifolia - regen	.	.	.	.	19	11	14	4
Thuja plicata - regen	.	.	11	1	19	4	14	8
Tsuga heterophylla - regen	64	3	.	.	29	9	36	1
Tsuga mertsensiana - regen	.	.	11	1	14	5	.	.
SHRUBS								
Acer circinatum	18	8	.	.	10	20	29	21
Alnus incana	9	3	.	.	.	.	14	1
Alnus rubra	82	37	100	47	19	13	21	24
Alnus sinuata	.	.	11	15	100	21	7	8
Berberis nervosa	.	.	.	.	29	3	7	2
Cornus stolonifera	9	2	.	.	.	.	100	57
Lonicera involucrata	9	5	.	.	14	12	7	5
Menziesia ferruginea	18	4	.	.	29	5	.	.
Oplopanax horridum	9	5	.	.	10	6	7	1
Pachistima myrsinites	.	.	11	1	14	8	7	1
Physocarpus capitatus	9	2	.	.	.	.	14	20
Ribes bracteosum	27	3	11	1	52	14	21	3
Ribes lacustre	18	1	.	.	52	7	29	2
Rosa gymnocarpa	9	7	.	.	10	4	29	2
Rubus parviflorus	27	2	56	1	33	18	36	7
Rubus pedatus	.	.	.	.	.	.	.	.
Rubus spectabilis	36	19	44	1	52	5	14	9
Rubus ursinus	.	.	.	.	.	.	14	10
Salix sitchensis	.	.	44	5	24	10	14	5
Sorbus sitchensis	9	20	.	.	24	7	.	.
Spiraea douglasii	9	20	.	.	10	2	7	2
Symphoricarpos albus	9	2	.	.	.	.	.	.
Vaccinium alaskaense	36	18	.	.	14	6	.	.
Vaccinium deliciosum	9	3	.	.	5	15	.	.
Vaccinium membranaceum	55	17	.	.	29	4	.	.
Vaccinium ovalifolium	55	17	.	.	71	15	.	.
Viburnum edule	36	9	.	.	33	9	7	13
FORBS								
Achlys triphylla	73	22	11	1	71	6	7	15

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ALRU (SHRUB)/TRCA3 11 Plots CON	%COV	ALRU(SHRUB) 9 Plots CON	%COV	ALSI 21 Plots CON	%COV	COST 14 Plots CON	%COV
Adiantum pedatum	.	.	.	.	.	.	14	1
Anaphalis margaritacea	.	.	56	1	5	5	7	1
Angelica arguta	18	1	.	.	10	1	29	7
Arnica latifolia	9	1	.	.	5	5	.	.
Aruncus sylvester	.	.	33	2	14	2	7	1
Asarum caudatum	.	.	.	.	5	1	36	1
Athyrium filix-femina	9	3	22	1	67	8	43	6
Blechnum spicant	.	.	.	.	10	3	7	1
Boykinia major	9	5	.	.	19	5	7	6
Circaea alpina	.	.	.	.	.	.	43	5
Cirsium arvense	.	.	.	.	.	.	.	.
Clintonia uniflora	55	1	.	.	33	3	7	1
Cornus canadensis	73	7	.	.	52	8	14	2
Corydalis aquae-gelidae	.	.	.	.	.	.	.	.
Corydalis scouleri	.	.	.	.	.	.	.	.
Epilobium angustifolium	.	.	11	1	5	5	21	1
Epilobium glaberrimum	9	1	22	1	5	1	21	2
Equisetum arvense	9	4	22	2	.	.	7	50
Fragaria vesca	.	.	11	15	.	.	7	1
Galium aparine	.	.	.	.	5	1	14	1
Galium oreganum	18	1	.	.	.	.	7	1
Galium triflorum	9	1	33	1	19	3	71	3
Gymnocarpium dryopteris	55	9	.	.	14	3	7	1
Heracleum lanatum	9	2	.	.	10	3	14	4
Hieracium albiflorum	.	.	44	1	5	1	.	.
Hydrophyllum tenuipes	.	.	.	.	.	.	7	10
Hypericum perforatum	.	.	22	1	.	.	14	2
Lactuca muralis	.	.	11	1	.	.	14	1
Linnaea borealis	36	4	.	.	48	7	.	.
Lotus corniculatus	.	.	11	1	.	.	.	.
Lysichitum americanum	9	1	.	.	5	3	14	4
Mimulus guttatus	.	.	.	.	14	1	29	1
Mitella breweri	18	3	.	.	19	1	7	1
Montia cordifolia	.	.	.	.	.	.	.	.
Montia parvifolia	.	.	33	7	10	1	7	1
Montia sibirica	.	.	11	1	19	5	21	2
Oenanthe sarmentosa	.	.	.	.	.	.	14	5
Osmorhiza chilensis	9	1	.	.	19	2	.	.
Oxalis oregana	.	.	.	.	.	.	.	.
Oxalis trilliifolia	.	.	.	.	.	.	.	.
Parnassia fimbriata	9	10	.	.	19	4	.	.
Petasites frigidus	27	3	33	2	19	4	21	5
Polystichum munitum	.	.	22	1	5	6	.	.
Senecio triangularis	18	2	.	.	38	1	14	1
Smilacina racemosa	.	.	.	.	10	3	7	2

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	ALRU (SHRUB)/TRCA3 11 Plots CON	%COV	ALRU(SHRUB) 9 Plots CON	%COV	ALSI 21 Plots CON	%COV	COST 14 Plots CON	%COV
Smilacina stellata	27	11	.	.	10	1	29	1
Stachys cooleyae	18	7	44	1	10	3	43	6
Stellaria crispa	.	.	11	1	5	1	7	1
Streptopus amplexifolius	45	2	.	.	29	2	14	1
Streptopus roseus	9	1	.	.	19	5	.	.
Thalictrum occidentale	.	.	.	.	.	.	7	15
Tiarella trifoliata unifoliata	18	3	.	.	52	2	14	1
Tolmiea menziesii	.	.	.	.	10	1	29	3
Trautvetteria caroliniensis	82	21	.	.	19	5	7	20
Trientalis latifolia	.	.	11	1	5	10	.	.
Trillium ovatum	18	1	.	.	14	1	.	.
Urtica dioica	.	.	.	.	.	.	29	12
Valeriana sitchensis	73	13	.	.	10	6	.	.
Vancouveria hexandra	36	20	.	.	5	1	.	.
Veratrum viride	9	1	.	.	14	1	14	2
Veronica americana	.	.	.	.	.	.	.	.
Viola glabella	9	1	.	.	14	4	14	2
GRASSES, GRASSLIKES								
Bromus vulgaris	.	.	.	.	5	1	7	1
Carex laeviculmis	.	.	11	1	.	.	14	1
Carex lenticularis	9	1	.	.	5	1	14	1
Carex spp.	.	.	22	1	10	1	.	.
Cinna latifolia	.	.	33	1	.	.	14	1
Deschampsia elongata	.	.	11	1	.	.	.	.
Elymus glaucus	.	.	56	2	.	.	.	.
Festuca subulata	.	.	22	1	.	.	7	1
Glyceria elata	.	.	11	1	10	2	29	4
Luzula parviflora	.	.	.	.	19	1	36	2
Phalaris arundinacea	.	.	.	.	.	.	14	3
Scirpus microcarpus	18	1	.	.	.	.	14	2
Unknown grass	9	1	.	.	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	OPHO 31 Plots CON	%COV	RIBR-RUSP/PEFR2 16 Plots CON	%COV	SASI2 7 Plots CON	%COV	SASI2/PEFR2 10 Plots CON	%COV
MATURE TREES								
Abies amabilis - mature	3	5	.	.	.	.	.	.
Alnus rubra - mature	10	8	.	.	57	30	10	5
Picea engelmannii - mature	.	.	.	.	.	.	.	.
REGEN TREES								
Abies amabilis - regen	10	3	13	5	.	.	.	.
Populus trichocarpa - regen	.	.	.	.	29	4	10	3
Pseudotsuga mertensiana - regen	.	.	.	.	14	1	.	.
Taxus brevifolia - regen	3	25	6	3	.	.	.	.
Thuja plicata - regen	16	2	19	7	.	.	.	.
Tsuga heterophylla - regen	23	2	19	1	29	1	.	.
Tsuga mertsensiana - regen	.	.	.	.	.	.	.	.
SHRUBS								
Acer circinatum	16	6	25	2	.	.	.	.
Alnus incana	.	.	6	5	.	.	.	.
Alnus rubra	10	7	19	2	57	6	60	13
Alnus sinuata	10	58	.	.	29	3	.	.
Berberis nervosa	.	.	.	.	.	.	.	.
Cornus stolonifera	.	.	.	.	29	17	.	.
Lonicera involucrata	.	.	.	.	.	.	.	.
Menziesia ferruginea	3	10	13	4	.	.	.	.
Oplopanax horridum	100	28	13	4	.	.	.	.
Pachistima myrsinites	.	.	.	.	.	.	.	.
Physocarpus capitatus	6	38	.	.	.	.	.	.
Ribes bracteosum	61	20	88	24	.	.	.	.
Ribes lacustre	19	6	19	3	14	3	.	.
Rosa gymnocarpa	13	6	13	1	.	.	.	.
Rubus parviflorus	10	4	19	30	29	3	10	15
Rubus pedatus	.	.	.	.	.	.	.	.
Rubus spectabilis	81	16	75	14	14	9	50	3
Rubus ursinus	6	2	6	7	29	9	10	2
Salix sitchensis	.	.	.	.	86	42	100	35
Sorbus sitchensis	.	.	6	1	.	.	.	.
Spiraea douglasii	.	.	.	.	14	7	.	.
Symphoricarpos albus	.	.	.	.	.	.	10	1
Vaccinium alaskaense	23	7	19	11	14	1	.	.
Vaccinium deliciosum	.	.	.	.	.	.	.	.
Vaccinium membranaceum	.	.	.	.	.	.	.	.
Vaccinium ovalifolium	16	6	6	4	.	.	.	.
Viburnum edule	3	15	.	.	.	.	.	.
FORBS								
Achlys triphylla	26	7	31	22	.	.	.	.

CON = Constancy = % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

			RIBR-RUSP/PEFR2				SASI2/PEFR2	
	OPHO				SASI2			
	31 Plots		16 Plots		7 Plots		10 Plots	
Species	CON	%COV	CON	%COV	CON	%COV	CON	%COV
Adiantum pedatum	10	1	6	2	29	1	20	1
Anaphalis margaritacea	.	.	6	1	43	2	10	1
Angelica arguta	6	2	31	2	29	1	10	1
Arnica latifolia	.	.	6	2	.	.	.	.
Aruncus sylvester	6	1	25	8	14	10	.	.
Asarum caudatum	13	6	6	1	.	.	.	.
Athyrium filix-femina	68	10	56	7	14	8	30	1
Blechnum spicant	16	2	6	5	.	.	.	.
Boykinia major	10	1	6	1	14	1	.	.
Circaea alpina	19	4	19	8	.	.	.	.
Cirsium arvense	.	.	.	.	.	.	10	5
Clintonia uniflora	10	1	13	1	.	.	.	.
Cornus canadensis	13	6	13	4	.	.	.	.
Corydalis aquae-gelidae	3	1	.	.	.	.	.	.
Corydalis scouleri	13	12	6	25	.	.	.	.
Epilobium angustifolium	.	.	6	1	14	2	.	.
Epilobium glaberrimum	3	1	31	1	29	1	20	2
Equisetum arvense	.	.	19	10	57	3	70	2
Fragaria vesca	.	.	.	.	14	1	.	.
Galium aparine	3	1	.	.	14	1	.	.
Galium oreganum	.	.	.	.	.	.	10	1
Galium triflorum	29	1	44	2	14	1	40	1
Gymnocarpium dryopteris	68	8	19	8	.	.	.	.
Heracleum lanatum	6	15	25	6	14	1	.	.
Hieracium albiflorum	.	.	.	.	.	.	.	.
Hydrophyllum tenuipes	19	9	.	.	.	.	.	.
Hypericum perforatum	3	10	6	5	14	1	.	.
Lactuca muralis	3	1	19	4	43	3	40	1
Linnaea borealis	3	20	19	3	.	.	.	.
Lotus corniculatus	.	.	.	.	14	20	10	10
Lysichitum americanum	13	11	.	.	.	.	.	.
Mimulus guttatus	6	2	31	2	43	1	50	4
Mitella breweri	6	1	19	2	29	2	.	.
Montia cordifolia	.	.	.	.	.	.	.	.
Montia parvifolia	10	1	13	2	29	1	30	1
Montia sibirica	23	1	25	9	43	4	30	1
Oenanthe sarmentosa	3	1	6	1	.	.	20	6
Osmorhiza chilensis	3	1	19	3	.	.	10	5
Oxalis oregana	52	19	19	1	.	.	20	1
Oxalis trilliifolia	3	5	25	9	.	.	.	.
Parnassia fimbriata	.	.	6	2	.	.	.	.
Petasites frigidus	23	8	94	14	14	1	100	23
Polystichum munitum	32	4	.	.	29	1	.	.
Senecio triangularis	16	2	6	1	.	.	.	.
Smilacina racemosa	3	5	.	.	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

	RIBR-RUSP/PEFR2						SASI2/PEFR2	
	OPHO				SASI2			
	31 Plots		16 Plots		7 Plots		10 Plots	
Species	CON	%COV	CON	%COV	CON	%COV	CON	%COV
Smilacina stellata	26	2	6	2	.	.	.	.
Stachys cooleyae	35	5	50	6	43	2	80	9
Stellaria crispa	.	.	6	1	29	1	.	.
Streptopus amplexifolius	16	1	25	1	.	.	.	.
Streptopus roseus	23	2	13	6	.	.	.	.
Thalictrum occidentale	6	3	.	.	.	.	.	.
Tiarella trifoliata unifoliata	26	2	31	3	.	.	.	.
Tolmiea menziesii	32	6	13	13	29	1	20	1
Trautvetteria caroliniensis	16	11	.	.	.	.	.	.
Trientalis latifolia	.	.	6	1	.	.	.	.
Trillium ovatum	10	1	13	1	.	.	.	.
Urtica dioica	.	.	13	16	.	.	20	6
Valeriana sitchensis	6	3	.	.	.	.	.	.
Vancouveria hexandra	3	1	.	.	.	.	.	.
Veratrum viride	3	1	13	20	.	.	.	.
Veronica americana	3	3	6	1	.	.	10	1
Viola glabella	16	7	19	2	.	.	.	.
GRASSES, GRASSLIKES								
Bromus vulgaris	3	1	13	7	.	.	.	.
Carex laeviculmis	3	1	6	1	.	.	.	.
Carex lenticularis	.	.	.	.	.	.	.	.
Carex spp.	6	1	.	.	.	.	.	.
Cinna latifolia	3	1	19	3	.	.	20	1
Deschampsia elongata	.	.	.	.	.	.	.	.
Elymus glaucus	.	.	19	2	57	3	30	2
Festuca subulata	3	2	13	2	14	2	.	.
Glyceria elata	13	3	13	1	14	3	20	18
Luzula parviflora	10	1	25	2	.	.	20	1
Phalaris arundinacea	.	.	.	.	.	.	10	40
Scirpus microcarpus	.	.	.	.	14	5	10	4
Unknown grass	19	1	19	1	.	.	50	2

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	VAAL-VAOV 29 Plots CON	%COV
MATURE TREES		
Abies amabilis - mature	3	25
Alnus rubra - mature	.	.
Picea engelmannii - mature	7	7
REGEN TREES		
Abies amabilis - regen	52	5
Populus trichocarpa - regen	.	.
Pseudotsuga mertensiana - regen	7	5
Taxus brevifolia - regen	17	5
Thuja plicata - regen	10	5
Tsuga heterophylla - regen	55	3
Tsuga mertsensiana - regen	14	4
SHRUBS		
Acer circinatum	7	16
Alnus incana	.	.
Alnus rubra	14	5
Alnus sinuata	7	3
Berberis nervosa	.	.
Cornus stolonifera	3	15
Lonicera involucrata	10	1
Menziesia ferruginea	41	9
Oplopanax horridum	.	.
Pachistima myrsinites	.	.
Physocarpus capitatus	7	3
Ribes bracteosum	28	5
Ribes lacustre	41	5
Rosa gymnocarpa	14	3
Rubus parviflorus	3	5
Rubus pedatus	7	4
Rubus spectabilis	48	5
Rubus ursinus	.	.
Salix sitchensis	7	6
Sorbus sitchensis	17	5
Spiraea douglasii	17	6
Symphoricarpos albus	3	40
Vaccinium alaskaense	41	28
Vaccinium deliciosum	.	.
Vaccinium membranaceum	34	5
Vaccinium ovalifolium	52	20
Viburnum edule	17	4
FORBS		
Achlys triphylla	76	6

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	VAAL-VAOV 29 Plots CON	%COV
Adiantum pedatum	.	.
Anaphalis margaritacea	.	.
Angelica arguta	24	2
Arnica latifolia	17	3
Aruncus sylvester	3	6
Asarum caudatum	7	2
Athyrium filix-femina	28	7
Blechnum spicant	14	2
Boykinia major	41	6
Circaea alpina	3	3
Cirsium arvense	.	.
Clintonia uniflora	38	3
Cornus canadensis	72	7
Corydalis aquae-gelidae	.	.
Corydalis scouleri	.	.
Epilobium angustifolium	.	.
Epilobium glaberrimum	10	1
Equisetum arvense	21	5
Fragaria vesca	3	5
Galium aparine	.	.
Galium oreganum	.	.
Galium triflorum	10	4
Gymnocarpium dryopteris	21	3
Heracleum lanatum	10	8
Hieracium albiflorum	3	1
Hydrophyllum tenuipes	.	.
Hypericum perforatum	.	.
Lactuca muralis	.	.
Linnaea borealis	34	6
Lotus corniculatus	.	.
Lysichitum americanum	10	4
Mimulus guttatus	10	4
Mitella breweri	21	4
Montia cordifolia	3	3
Montia parvifolia	3	3
Montia sibirica	.	.
Oenanthe sarmentosa	3	1
Osmorhiza chilensis	10	1
Oxalis oregana	10	3
Oxalis trilliifolia	.	.
Parnassia fimbriata	17	7
Petasites frigidus	14	5
Polystichum munitum	.	.
Senecio triangularis	52	2
Smilacina racemosa	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

SHRUB TYPES - COVER AND CONSTANCY

Species	VAAL-VAOV 29 Plots CON	%COV
Smilacina stellata	28	2
Stachys cooleyae	7	1
Stellaria crispa	.	.
Streptopus amplexifolius	45	4
Streptopus roseus	31	2
Thalictrum occidentale	3	1
Tiarella trifoliata unifoliata	59	5
Tolmiea menziesii	7	2
Trautvetteria caroliniensis	24	4
Trientalis latifolia	3	1
Trillium ovatum	14	2
Urtica dioica	.	.
Valeriana sitchensis	14	3
Vancouveria hexandra	10	5
Veratrum viride	21	10
Veronica americana	3	2
Viola glabella	28	4
GRASSES, GRASSLIKES		
Bromus vulgaris	3	15
Carex laeviculmis	21	3
Carex lenticularis	.	.
Carex spp.	21	2
Cinna latifolia	.	.
Deschampsia elongata	.	.
Elymus glaucus	.	.
Festuca subulata	.	.
Glyceria elata	24	4
Luzula parviflora	14	1
Phalaris arundinacea	.	.
Scirpus microcarpus	7	6
Unknown grass	10	1

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	ADPE 23 Plots CON	%COV	CALE5 3 Plots CON	%COV	COAQ 3 Plots CON	%COV	EQUIS 10 Plots CON	%COV	HYPE 3 Plots CON	%COV
REGEN TREES										
Abies amabilis - regen	.	.	.	.	.	.	.	.	.	.
Abies grandis - regen	.	.	.	.	.	.	10	1	.	.
Abies lasiocarpa - regen	.	.	.	.	.	.	.	.	.	.
Acer macrophyllum - regen	9	3	.	.	.	.	20	1	.	.
Picea engelmannii - regen	.	.	.	.	.	.	.	.	.	.
Pseudotsuga mertensiana - regen	.	.	33	1	.	.	10	2	.	.
Taxus brevifolia - regen	.	.	.	.	.	.	.	.	.	.
Thuja plicata - regen	26	9	.	.	.	.	10	3	.	.
Tsuga heterophylla - regen	9	1	.	.	.	.	.	.	.	.
SHRUBS										
Acer circinatum	22	4	.	.	.	.	.	.	.	.
Acer glabrum douglasii	4	4	.	.	.	.	.	.	.	.
Alnus incana	.	.	33	1	33	1	10	4	.	.
Alnus rubra - regen	17	5	.	.	.	.	70	5	33	1
Alnus sinuata	4	2	.	.	.	.	.	.	.	.
Cornus stolonifera	.	.	33	3	.	.	.	.	.	.
Lonicera involucrata	.	.	33	5	.	.	.	.	.	.
Menziesia ferruginea	.	.	.	.	.	.	.	.	.	.
Oplopanax horridum	17	5	.	.	.	.	.	.	.	.
Physocarpus capitatus	4	20	33	1	33	2	.	.	.	.
Ribes bracteosum	39	3	.	.	.	.	10	1	.	.
Ribes lacustre	22	1	.	.	.	.	20	1	.	.
Rosa gymnocarpa	4	1	.	.	.	.	10	2	.	.
Rubus leucodermis	.	.	.	.	.	.	.	.	.	.
Rubus parviflorus	17	25	.	.	.	.	10	1	33	1
Rubus spectabilis	39	3	.	.	.	.	30	1	.	.
Rubus ursinus	26	1	33	1	.	.	20	2	.	.
Salix sitchensis	13	7	33	1	.	.	20	3	67	3
Spiraea douglasii	.	.	33	1	.	.	.	.	.	.
Symphoricarpos albus	4	1	.	.	.	.	10	1	.	.
Vaccinium ovalifolium	4	5	.	.	.	.	.	.	.	.
FORBS										
Aconitum columbianum	.	.	.	.	67	1	.	.	.	.
Achlys triphylla	22	2	.	.	.	.	.	.	.	.
Actaea rubra	4	1	.	.	.	.	.	.	.	.
Adenocaulon bicolor	4	1	.	.	.	.	.	.	.	.
Adiantum pedatum	96	15	.	.	.	.	10	2	.	.
Anaphalis margaritacea	.	.	.	.	.	.	20	3	.	.
Anemone deltoidea	4	1	.	.	.	.	.	.	.	.
Angelica arguta	4	1	33	4	.	.	40	2	.	.
Aquilegia formosa	4	1	.	.	.	.	10	1	.	.
Arnica amplexicaulis	4	30	.	.	.	.	30	3	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	ADPE 23 Plots CON	%COV	CALE5 3 Plots CON	%COV	COAQ 3 Plots CON	%COV	EQUIS 10 Plots CON	%COV	HYPE 3 Plots CON	%COV
Aruncus sylvester	57	12	.	.	.	.	10	25	.	.
Aster modestus	9	4	33	1	67	1	30	3	33	1
Athyrium filix-femina	61	10	67	1	33	1	20	1	.	.
Blechnum spicant	9	1	.	.	.	.	.	.	.	.
Boykinia major	4	1	.	.	.	.	.	.	.	.
Caltha biflora	.	.	.	.	.	.	.	.	.	.
Cardamine cordifolia	.	.	.	.	.	.	20	2	.	.
Cerastium vulgatum	.	.	.	.	.	.	.	.	67	1
Chrysanthemum leucanthemum	.	.	.	.	.	.	10	1	100	2
Circaea alpina	22	2	.	.	.	.	10	5	.	.
Cirsium vulgare	.	.	.	.	.	.	20	1	.	.
Clintonia uniflora	.	.	.	.	.	.	.	.	.	.
Cornus canadensis	.	.	.	.	.	.	.	.	.	.
Corydalis aquae-gelidae	.	.	.	.	100	67	.	.	.	.
Corydalis scouleri	17	9	.	.	.	.	.	.	.	.
Delphinium glareosum	.	.	.	.	67	1	.	.	.	.
Epilobium alpinum	9	2	.	.	.	.	10	1	.	.
Epilobium angustifolium	4	1	.	.	.	.	10	2	.	.
Epilobium glaberrimum	9	1	.	.	.	.	40	5	.	.
Epilobium glandulosum	.	.	.	.	33	1	.	.	.	.
Epilobium luteum	.	.	33	3	.	.	10	1	.	.
Epilobium watsonii	4	1	33	3	.	.	.	.	33	1
Equisetum arvense	.	.	.	.	.	.	100	37	67	2
Galium oreganum	4	1	.	.	.	.	10	1	.	.
Galium triflorum	65	2	.	.	33	1	40	1	33	1
Gymnocarpium dryopteris	.	.	.	.	.	.	10	1	.	.
Habenaria saccata	.	.	33	1	.	.	.	.	.	.
Heracleum lanatum	4	2	.	.	33	5	.	.	.	.
Hypericum perforatum	.	.	67	1	33	2	.	.	100	5
Lactuca muralis	30	6	.	.	.	.	20	1	.	.
Linnaea borealis	.	.	.	.	.	.	.	.	.	.
Lysichitum americanum	.	.	33	10	.	.	10	7	.	.
Mertensia paniculata	.	.	.	.	33	2	.	.	.	.
Mimulus guttatus	17	2	33	1	33	1	40	1	33	1
Mimulus moschatus	.	.	33	5	.	.	10	1	33	1
Mitella pentandra	.	.	.	.	.	.	.	.	.	.
Montia parvifolia	17	3	33	1	.	.	30	1	33	1
Montia sibirica	39	1	.	.	.	.	20	1	33	1
Osmorhiza chilensis	9	1	.	.	.	.	20	1	.	.
Oxalis oregana	30	6	.	.	.	.	.	.	.	.
Oxalis trilliifolia	13	8	.	.	.	.	.	.	.	.
Petasites frigidus	26	2	33	1	.	.	70	11	.	.
Polystichum munitum	52	4	.	.	.	.	10	1	.	.
Rumex crispus	.	.	.	.	.	.	10	1	67	1
Saxifraga arguta	4	20	.	.	.	.	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	ADPE 23 Plots CON	%COV	CALE5 3 Plots CON	%COV	COAQ 3 Plots CON	%COV	EQUIS 10 Plots CON	%COV	HYPE 3 Plots CON	%COV
Senecio jacobaea	.	.	.	.	.	.	.	.	67	2
Senecio pseudaureus	.	.	67	1	67	5	.	.	.	.
Senecio triangularis	.	.	67	2	67	2	20	5	.	.
Smilacina stellata	4	1	.	.	.	.	.	.	.	.
Stachys cooleyae	30	6	33	2	.	.	80	7	67	4
Streptopus amplexifolius	30	1	.	.	.	.	.	.	.	.
Streptopus roseus	.	.	.	.	.	.	.	.	.	.
Tiarella trifoliata unifoliata	30	2	.	.	.	.	.	.	.	.
Tolmiea menziesii	26	3	.	.	.	.	.	.	.	.
Trautvetteria caroliniensis	4	2	33	1	.	.	.	.	.	.
Valeriana sitchensis	13	7	.	.	.	.	.	.	.	.
Vancouveria hexandra	30	2	.	.	33	1	.	.	.	.
Veronica americana	.	.	67	1	.	.	10	3	33	1
Viola glabella	13	1	.	.	33	1	10	40	.	.
Viola palustris	.	.	33	3	33	6	.	.	.	.
GRASSES, GRASSLIKES										
Bromus vulgaris	9	10	.	.	33	1	.	.	.	.
Carex laeviculmis	9	1	33	20	.	.	40	1	.	.
Carex lenticularis	.	.	100	33	33	1	10	1	.	.
Cinna latifolia	9	2	.	.	.	.	40	2	.	.
Elymus glaucus	17	4	.	.	.	.	40	3	67	6
Festuca subulata	17	9	.	.	.	.	.	.	.	.
Glyceria elata	4	1	67	6	33	1	40	5	.	.
Juncus effusus	.	.	.	.	.	.	10	3	.	.
Juncus ensifolius	.	.	33	7	.	.	20	2	33	4
Phalaris arundinacea	.	.	33	2	33	1	.	.	33	1
Poa palustris	.	.	.	.	.	.	.	.	33	2
Poa trivialis	4	3	.	.	.	.	10	1	.	.
Scirpus microcarpus	.	.	67	4	.	.	10	1	.	.
Unknown grass	26	4	.	.	.	.	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	LYAM 10 Plots CON	%COV	MIGU 18 Plots CON	%COV	OXALIS 9 Plots CON	%COV	PEFR2 34 Plots CON	%COV	SAAR4-SETR 8 Plots CON	%COV
REGEN TREES										
Abies amabilis - regen	30	2	.	.	.	.	3	2	38	4
Abies grandis - regen	.	.	.	.	.	.	6	5	.	.
Abies lasiocarpa - regen	.	.	.	.	.	.	.	.	.	.
Acer macrophyllum - regen	.	.	6	1	.	.	3	1	.	.
Picea engelmannii - regen	10	1	6	5	.	.	6	4	13	3
Pseudotsuga mertensiana - regen	.	.	6	3	.	.	6	1	.	.
Taxus brevifolia - regen	30	4	.	.	.	.	6	1	13	10
Thuja plicata - regen	50	5	.	.	22	3	12	2	25	1
Tsuga heterophylla - regen	20	1	6	5	22	1	24	1	38	4
SHRUBS										
Acer circinatum	20	1	.	.	.	.	6	2	.	.
Acer glabrum douglasii	.	.	.	.	.	.	9	2	.	.
Alnus incana	20	2	11	3	.	.	3	1	.	.
Alnus rubra - regen	40	3	11	4	.	.	47	2	.	.
Alnus sinuata	10	2	.	.	.	.	9	1	38	4
Cornus stolonifera	.	.	6	5	.	.	3	1	.	.
Lonicera involucrata	.	.	.	.	.	.	.	.	.	.
Menziesia ferruginea	10	10	.	.	.	.	3	2	13	1
Oplopanax horridum	10	1	.	.	.	.	.	.	.	.
Physocarpus capitatus	.	.	.	.	.	.	6	1	.	.
Ribes bracteosum	10	8	17	1	22	4	47	3	38	10
Ribes lacustre	30	5	11	4	.	.	12	3	63	12
Rosa gymnocarpa	10	1	.	.	.	.	6	1	.	.
Rubus leucodermis	.	.	.	.	.	.	3	1	.	.
Rubus parviflorus	10	8	.	.	.	.	6	1	.	.
Rubus spectabilis	50	3	17	1	56	2	21	2	38	9
Rubus ursinus	10	2	6	5	.	.	6	1	.	.
Salix sitchensis	10	3	11	2	.	.	18	2	.	.
Spiraea douglasii	.	.	6	1	.	.	.	.	.	.
Symphoricarpos albus	.	.	.	.	.	.	3	1	.	.
Vaccinium ovalifolium	30	4	.	.	22	2	3	1	13	3
FORBS										
Aconitum columbianum	.	.	.	.	.	.	6	1	.	.
Achlys triphylla	.	.	.	.	.	.	15	6	.	.
Actaea rubra	.	.	.	.	11	7	.	.	.	.
Adenocaulon bicolor	10	1	.	.	11	1	12	2	.	.
Adiantum pedatum	.	.	6	1	22	5	3	12	13	1
Anaphalis margaritacea	.	.	6	8	.	.	21	2	13	1
Anemone deltoidea	10	1	.	.	.	.	6	1	13	1
Angelica arguta	30	5	17	13	11	2	12	2	.	.
Aquilegia formosa	.	.	11	1	.	.	9	1	.	.
Arnica amplexicaulis	.	.	28	9	.	.	3	4	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	LYAM 10 Plots CON	%COV	MIGU 18 Plots CON	%COV	OXALIS 9 Plots CON	%COV	PEFR2 34 Plots CON	%COV	SAAR4-SETR 8 Plots CON	%COV
Aruncus sylvester	.	.	17	2	22	2	3	2	.	.
Aster modestus	.	.	6	1	.	.	3	5	.	.
Athyrium filix-femina	50	12	22	2	78	4	38	2	25	1
Blechnum spicant	10	3	.	.	11	1	3	3	.	.
Boykinia major	30	11	6	15	11	10	.	.	.	.
Caltha biflora	10	10	.	.	11	2	3	1	50	15
Cardamine cordifolia	.	.	17	1	.	.	3	1	.	.
Cerastium vulgatum	.	.	.	.	.	.	.	.	.	.
Chrysanthemum leucanthemum	.	.	.	.	.	.	9	1	.	.
Circaea alpina	10	1	22	1	11	1	18	2	50	3
Cirsium vulgare	.	.	.	.	.	.	3	1	.	.
Clintonia uniflora	20	2	.	.	22	2	.	.	13	1
Cornus canadensis	30	3	6	7	.	.	12	10	13	1
Corydalis aquae-gelidae	.	.	.	.	.	.	.	.	.	.
Corydalis scouleri	.	.	.	.	56	43	9	6	.	.
Delphinium glareosum	.	.	.	.	.	.	.	.	.	.
Epilobium alpinum	.	.	17	3	.	.	15	3	63	3
Epilobium angustifolium	.	.	.	.	.	.	3	1	25	1
Epilobium glaberrimum	40	4	28	4	11	1	24	1	25	15
Epilobium glandulosum	.	.	17	3	.	.	6	1	13	6
Epilobium luteum	.	.	6	2	.	.	15	3	.	.
Epilobium watsonii	.	.	6	1	.	.	.	.	13	20
Equisetum arvense	10	10	11	4	.	.	26	3	25	3
Galium oreganum	.	.	.	.	11	5	15	1	.	.
Galium triflorum	20	1	33	1	44	2	47	2	13	1
Gymnocarpium dryopteris	10	20	.	.	33	3	12	2	.	.
Habenaria saccata	30	2	11	1	.	.	3	1	13	1
Heracleum lanatum	.	.	11	1	11	1	9	2	.	.
Hypericum perforatum	.	.	11	2	.	.	6	1	.	.
Lactuca muralis	.	.	11	5	11	1	12	1	.	.
Linnaea borealis	10	10	.	.	22	16	12	2	25	4
Lysichitum americanum	100	17	6	2	.	.	6	3	.	.
Mertensia paniculata	.	.	.	.	.	.	.	.	13	1
Mimulus guttatus	30	3	100	20	11	1	44	5	38	2
Mimulus moschatus	10	15	.	.	.	.	.	.	.	.
Mitella pentandra	20	5	6	1	11	7	3	15	25	1
Montia parvifolia	.	.	39	7	11	10	35	1	25	4
Montia sibirica	.	.	28	4	22	9	32	1	.	.
Osmorhiza chilensis	10	1	11	6	33	1	15	2	25	9
Oxalis oregana	.	.	6	1	44	15	24	3	.	.
Oxalis trilliifolia	.	.	6	2	44	38	15	2	.	.
Petasites frigidus	20	4	22	3	33	1	100	39	.	.
Polystichum munitum	.	.	6	1	33	7	.	.	13	1
Rumex crispus	.	.	11	1	.	.	3	1	.	.
Saxifraga arguta	.	.	17	2	.	.	9	2	100	24

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

	LYAM		MIGU		OXALIS		PEFR2		SAAR4-SETR	
	10 Plots		18 Plots		9 Plots		34 Plots		8 Plots	
Species	CON	%COV	CON	%COV	CON	%COV	CON	%COV	CON	%COV
Senecio jacobaea	.	.	6	1	.	.	3	1	.	.
Senecio pseudaureus	.	.	6	1	.	.	.	.	.	.
Senecio triangularis	70	4	6	1	22	4	24	2	100	10
Smilacina stellata	10	3	6	3	.	.	6	1	.	.
Stachys cooleyae	30	9	33	3	67	7	65	4	.	.
Streptopus amplexifolius	40	2	11	2	11	1	3	2	25	11
Streptopus roseus	20	3	.	.	11	1	6	3	13	1
Tiarella trifoliata unifoliata	50	4	11	10	44	1	15	2	63	7
Tolmiea menziesii	10	2	11	1	44	2	24	1	.	.
Trautvetteria caroliniensis	30	5	6	2	11	1	6	4	13	1
Valeriana sitchensis	.	.	6	1	.	.	.	.	13	1
Vancouveria hexandra	.	.	.	.	11	20	3	4	13	1
Veronica americana	10	1	22	6	.	.	6	1	.	.
Viola glabella	10	1	22	2	11	1	12	1	38	3
Viola palustris	.	.	.	.	.	.	3	1	.	.
GRASSES, GRASSLIKES										
Bromus vulgaris	.	.	6	1	33	5	12	3	.	.
Carex laeviculmis	40	8	6	3	22	4	9	1	.	.
Carex lenticularis	20	4	6	7	.	.	3	1	.	.
Cinna latifolia	.	.	11	4	11	2	12	1	.	.
Elymus glaucus	.	.	17	6	.	.	15	1	.	.
Festuca subulata	.	.	11	2	11	3	3	1	.	.
Glyceria elata	50	4	44	6	11	5	15	2	.	.
Juncus effusus	10	1	.	.	.	.	.	.	.	.
Juncus ensifolius	10	3	11	1	.	.	3	1	.	.
Phalaris arundinacea	.	.	.	.	.	.	.	.	.	.
Poa palustris	.	.	.	.	.	.	3	1	.	.
Poa trivialis	.	.	6	15	.	.	.	.	.	.
Scirpus microcarpus	.	.	6	1	.	.	6	1	.	.
Unknown grass	.	.	17	1	.	.	38	1	63	3

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	SCMI 3 Plots CON	%COV	SETR-ASMO 9 Plots CON	%COV	STCO4-ATFI 8 Plots CON	%COV	STCO4-MIGU 12 Plots CON	%COV
REGEN TREES								
Abies amabilis - regen	.	.	22	7	.	.	.	.
Abies grandis - regen	.	.	11	1	.	.	.	.
Abies lasiocarpa - regen	.	.	22	3	.	.	.	.
Acer macrophyllum - regen	.	.	.	.	.	.	.	.
Picea engelmannii - regen	.	.	44	2	.	.	.	.
Pseudotsuga mertensiana - regen	.	.	11	1	.	.	8	1
Taxus brevifolia - regen	.	.	.	.	.	.	.	.
Thuja plicata - regen	.	.	11	2	13	1	8	6
Tsuga heterophylla - regen	.	.	44	2	.	.	.	.
SHRUBS								
Acer circinatum	.	.	.	.	13	1	17	4
Acer glabrum douglasii	.	.	11	1	.	.	8	1
Alnus incana	.	.	33	1	.	.	.	.
Alnus rubra - regen	33	20	.	.	25	1	25	1
Alnus sinuata	.	.	.	.	.	.	.	.
Cornus stolonifera	.	.	.	.	.	.	8	1
Lonicera involucrata	.	.	.	.	.	.	.	.
Menziesia ferruginea	.	.	.	.	.	.	.	.
Oplopanax horridum	.	.	.	.	.	.	8	2
Physocarpus capitatus	.	.	33	6	.	.	17	16
Ribes bracteosum	.	.	11	1	38	1	17	1
Ribes lacustre	.	.	22	2	25	4	.	.
Rosa gymnocarpa	.	.	22	2	25	5	8	1
Rubus leucodermis	.	.	.	.	.	.	8	1
Rubus parviflorus	.	.	22	1	13	1	.	.
Rubus spectabilis	33	40	.	.	38	1	33	2
Rubus ursinus	.	.	.	.	25	8	.	.
Salix sitchensis	33	4	.	.	13	2	.	.
Spiraea douglasii	33	1	56	2	.	.	.	.
Symphoricarpos albus	.	.	11	7	.	.	.	.
Vaccinium ovalifolium	.	.	56	3	.	.	.	.
FORBS								
Aconitum columbianum	.	.	67	7	.	.	17	5
Achlys triphylla	.	.	22	2	25	10	8	2
Actaea rubra	.	.	.	.	25	2	8	3
Adenocaulon bicolor	.	.	.	.	13	15	.	.
Adiantum pedatum	.	.	.	.	.	.	.	.
Anaphalis margaritacea	.	.	.	.	.	.	8	2
Anemone deltoidea	.	.	.	.	.	.	.	.
Angelica arguta	.	.	.	.	13	1	17	3
Aquilegia formosa	.	.	22	1	25	1	.	.
Arnica amplexicaulis	.	.	.	.	13	12	8	1

CON = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	SCMI 3 Plots CON	%COV	SETR-ASMO 9 Plots CON	%COV	STCO4-ATFI 8 Plots CON	%COV	STCO4-MIGU 12 Plots CON	%COV
Aruncus sylvester	.	.	.	.	.	.	.	.
Aster modestus	.	.	67	10	.	.	17	7
Athyrium filix-femina	.	.	33	2	88	7	33	2
Blechnum spicant	.	.	.	.	.	.	.	.
Boykinia major	.	.	.	.	.	.	17	6
Caltha biflora	.	.	22	4	.	.	.	.
Cardamine cordifolia	.	.	.	.	13	1	8	3
Cerastium vulgatum	.	.	.	.	13	1	.	.
Chrysanthemum leucanthemum	.	.	.	.	.	.	8	1
Circaea alpina	.	.	.	.	13	1	33	14
Cirsium vulgare	33	2	.	.	13	1	.	.
Clintonia uniflora	.	.	.	.	13	1	.	.
Cornus canadensis	.	.	22	1	.	.	.	.
Corydalis aquae-gelidae	.	.	11	3	.	.	.	.
Corydalis scouleri	.	.	.	.	.	.	8	10
Delphinium glareosum	.	.	33	4	.	.	.	.
Epilobium alpinum	.	.	22	2	.	.	.	.
Epilobium angustifolium	.	.	.	.	13	5	.	.
Epilobium glaberrimum	.	.	11	1	13	1	25	3
Epilobium glandulosum	.	.	.	.	.	.	17	3
Epilobium luteum	.	.	.	.	13	3	.	.
Epilobium watsonii	.	.	.	.	.	.	.	.
Equisetum arvense	67	12	.	.	13	1	33	8
Galium oreganum	.	.	.	.	13	1	.	.
Galium triflorum	.	.	44	2	75	3	50	3
Gymnocarpium dryopteris	.	.	11	4	.	.	.	.
Habenaria saccata	.	.	56	1	.	.	.	.
Heracleum lanatum	.	.	56	3	38	7	25	7
Hypericum perforatum	.	.	33	2	.	.	.	.
Lactuca muralis	.	.	.	.	25	3	17	1
Linnaea borealis	.	.	22	5	13	33	.	.
Lysichitum americanum	.	.	.	.	13	1	17	4
Mertensia paniculata	.	.	67	2	.	.	.	.
Mimulus guttatus	33	2	.	.	25	2	67	8
Mimulus moschatus	.	.	.	.	.	.	17	6
Mitella pentandra	.	.	.	.	.	.	.	.
Montia parvifolia	.	.	.	.	13	1	17	2
Montia sibirica	.	.	.	.	50	2	33	2
Osmorhiza chilensis	.	.	22	2	13	1	8	1
Oxalis oregana	.	.	.	.	25	4	25	4
Oxalis trilliifolia	.	.	.	.	13	8	.	.
Petasites frigidus	.	.	.	.	38	4	42	3
Polystichum munitum	.	.	.	.	25	4	.	.
Rumex crispus	.	.	.	.	.	.	8	1
Saxifraga arguta	.	.	.	.	.	.	.	.

CON = Constancy = the % of plots with that species
%COV = % Foliar Cover

HERBACEOUS TYPES - COVER AND CONSTANCY

Species	SCMI 3 Plots		SETR-ASMO 9 Plots		STCO4-ATFI 8 Plots		STCO4-MIGU 12 Plots	
	CON	%COV	CON	%COV	CON	%COV	CON	%COV
Senecio jacobaea	.	.	.	.	.	.	8	1
Senecio pseudaureus	.	.	56	13	.	.	.	.
Senecio triangularis	33	1	100	11	25	7	25	13
Smilacina stellata	.	.	11	1	13	1	.	.
Stachys cooleyae	67	17	44	1	100	19	92	25
Streptopus amplexifolius	.	.	33	6	.	.	8	1
Streptopus roseus	.	.	11	10	.	.	.	.
Tiarella trifoliata unifoliata	.	.	67	1	25	3	.	.
Tolmiea menziesii	.	.	.	.	63	8	42	5
Trautvetteria caroliniensis	.	.	56	6	25	5	.	.
Valeriana sitchensis	.	.	78	1	.	.	.	.
Vancouveria hexandra	.	.	56	4	.	.	.	.
Veronica americana	33	1	11	1	13	2	33	3
Viola glabella	.	.	33	3	50	7	17	1
Viola palustris	.	.	22	6	25	5	8	1
	.	.	.	.	.	.	.	.
GRASSES, GRASSLIKES								
Bromus vulgaris	.	.	22	10	.	.	.	.
Carex laeviculmis	.	.	11	3	.	.	8	4
Carex lenticularis	33	10	.	.	.	.	8	3
Cinna latifolia	.	.	11	1	.	.	8	30
Elymus glaucus	.	.	.	.	.	.	8	15
Festuca subulata	.	.	.	.	.	.	8	2
Glyceria elata	33	1	11	5	25	1	42	11
Juncus effusus	33	1	.	.	.	.	.	.
Juncus ensifolius	33	1	.	.	.	.	.	.
Phalaris arundinacea	33	5	11	1	.	.	.	.
Poa palustris	.	.	.	.	.	.	.	.
Poa trivialis	33	2	.	.	.	.	.	.
Scirpus microcarpus	100	68	.	.	.	.	8	1
Unknown grass	.	.	22	1	50	2	33	7

CON = the % of plots with that species
%COV = % Foliar Cover

APPENDIX E

WILDLIFE HABITAT RELATIONSHIPS: SPECIES TABLES

Table E-1. Amphibians and reptiles using streamside riparian habitats on the Mt. Hood and/or Gifford Pinchot National forests. The riparian habitat types used by each species is indicated by an "X" in the appropriate column. Those species with a "Y" in the Riparian Species column are strongly tied to streamside riparian habitat - they are rarely found outside riparian areas.

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Northwestern salamander[1]	*Ambystoma gracile*		X	X	X	
Long-toed salamander[1]	*Ambystoma macrodactylum*		X	X	X	
Cope's giant salamander	*Dicamptodon copei*	Y				X
Pacific giant salamander	*Dicamptodon tenebrosus*	Y			X	X
Cascade torrent salamander	*Rhyacotriton cascadae*	Y			X	X
Ensatina	*Ensatina eschscholtzii*				X	
Dunn's salamander	*Plethodon dunni*	Y			X	
Larch mountain salamander	*Plethodon larselli*					
Van Dyke's salamander	*Plethodon vandykei*	Y			X	X
Western red-backed salamander	*Plethodon vehiculum*				X	
Rough-skinned newt[2]	*Taricha granulosa*		X	X	X	X
Western toad[1]	*Bufo boreas*		X	X	X	
Pacific treefrog[1]	*Pseudacris regilla*		X	X	X	
Tailed frog	*Ascaphus truei*	Y			X	X
Red-legged frog[2]	*Rana aurora*	Y			X	X
Cascades frog[3]	*Rana cascadae*	Y	X			X
Bull frog[3]	*Rana catesbeiana*	Y				X
Spotted frog[3]	*Rana pretiosa*	Y				X
Painted turtle[2]	*Chrysemys picta*	Y	X	X		X
Western pond turtle[2]	*Clemmys marmorata*	Y	X	X		X
Northern alligator lizard	*Elgaria coerulea*		X	X	X	
Southern alligator lizard	*Elgaria multicarinata*		X	X	X	
Western skink	*Eumeces skiltonianus*		X	X		
Rubber boa	*Charina bottae*		X	X	X	
Racer	*Coluber constrictor*		X	X		
Sharptail snake	*Contia tenuis*		X	X	X	
Ringneck snake	*Diadophis punctatus*		X	X	X	
California mountain kingsnake	*Lampropeltis zonata*			X		
Gopher snake	*Pituophis catenifer*		X	X		

Table E-1 (cont).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Western terrestrial garter snake	*Thamnophis elegans*		X	X		
Northwestern garter snake	*Thamnophis ordinoides*		X	X		
Common garter snake	*Thamnophis sirtalis*	Y	X	X		X

[1] These species breed only in lakes and ponds but adults may be found in streamside riparian habitat outside the breeding sason.
[2] These species breed primarily in lakes and ponds but will occasionally breed in slow-moving sections of rivers. They may also be found in streamside riparian habitats during the non-breeding season.
[3] These frogs breed exclusively in lakes and ponds but during the non-breeding season they may use slow-moving sections of streams or rivers that meander through wetlands.

Table E-2. Mammals using streamside riparian habitats on the Mt. Hood and/or Gifford Pinchot National forests. The riparian habitat types used by each species is indicated by an "X" in the appropriate column. Those species with a "Y" in the Riparian Species column are strongly tied to streamside riparian habitat - they are rarely found outside riparian areas.

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Virginia opossum	*Didelphis virginiana*		X	X	X	
Masked shrew	*Sorex cinereus*		X	X	X	
Vagrant shrew	*Sorex vagrans*		X	X	X	
Baird's shrew	*Sorex bairdii*		X	X	X	
Dusky shrew	*Sorex monticolus*	Y			X	
Pacific shrew	*Sorex pacificus*	Y	X	X	X	
Water shrew	*Sorex palustris*	Y		X	X	X
Pacific water shrew	*Sorex bendirii*	Y		X	X	X
Trowbridge's shrew	*Sorex trowbridgii*	Y			X	
Merriam's shrew	*Sorex merriami*	Y	X	X		
Shrew-mole	*Neurotrichus gibbsii*				X	
Townsend's mole	*Scapanus townsendii*		X	X		
Coast mole	*Scapanus orarius*		X	X	X	
Little brown myotis	*Myotis lucifugus*		X	X	X	
Yuma myotis	*Myotis yumanensis*		X	X	X	
Keen's myotis	*Myotis keenii*		X	X	X	
Long-eared myotis	*Myotis evotis*			X	X	
Fringed myotis	*Myotis thysanodes*		X	X	X	
Long-legged myotis	*Myotis volans*		X	X	X	
California myotis	*Myotis californicus*		X	X	X	
Western small-footed myotis	*Myotis ciliolabrum*		X	X		
Silver-haired bat	*Lasionycteris noctivagans*		X		X	
Western pipistrelle	*Pipistrellus hesperus*		X	X		
Big brown bat	*Eptesicus fuscus*		X		X	
Hoary bat	*Lasiurus cinereus*			X	X	
Townsend's big-eared bat	*Plecotus townsendii*				X	
Pallid bat	*Antrozous pallidus*		X	X	X	
Brush rabbit	*Sylvilagus bachmani*		X	X	X	
Eastern cottontail	*Sylvilagus floridanus*		X	X		
Mountain (nuttall's) cottontail	*Sylvilagus nuttallii*		X	X		

Table E-2 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Snowshoe hare	*Lepus americanus*		X	X	X	
Mountain beaver	*Aplodontia rufa*		X	X	X	
Least chipmunk	*Tamias minimus*		X	X		
Yellow-pine chipmunk	*Tamias amoenus*		X	X	X	
Townsend's chipmunk	*Tamias townsendii*				X	
Golden-mantled ground squirrel	*Spermophilus lateralis*		X	X	X	
Cascade golden-mantled ground squirrel	*Spermophilus saturatus*		X	X	X	
Western gray squirrel	*Sciurus griseus*				X	
Douglas' squirrel	*Tamiasciurus douglasii*				X	
Northern flying squirrel	*Glaucomys sabrinus*				X	
Northern pocket gopher	*Thomomys talpoides*		X			
Great basin pocket mouse	*Perognathus parvus*		X			
Beaver	*Castor canadensis*	Y		X	X	X
Forest (long-tailed) deer mouse	*Peromyscus oreas*				X	
Deer mouse	*Peromyscus maniculatus*		X	X	X	
Bushy-tailed woodrat	*Neotoma cinerea*			X	X	
Southern red-backed vole	*Clethrionomys gapperi*				X	
Heather vole	*Phenacomys intermedius*		X	X	X	
Red tree vole	*(Arborimus) Phenacomys longicaudus*				X	
Townsend's vole	*Microtus townsendii*		X	X		
Long-tailed vole	*Microtus longicaudus*		X	X		
Creeping vole	*Microtus oregoni*		X	X	X	
Water vole	*Microtus richardsoni*	Y	X	X		X
Muskrat	*Ondatra zibethicus*	Y	X	X		X
Western jumping mouse	*Zapus princeps*	Y	X			
Pacific jumping mouse	*Zapus trinotatus*	Y	X			
Porcupine	*Erethizon dorsatum*		X	X	X	
Coyote	*Canis latrans*		X	X	X	
Gray wolf	*Canis lupus*		X	X	X	
Red fox	*Vulpes vulpes*		X	X		
Gray fox	*Urocyon cinereoargenteus*		X	X	X	
Black bear	*Ursus americanus*		X	X	X	

Table E-2 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Raccoon	*Procyon lotor*		X	X	X	
Marten	*Martes americana*				X	
Fisher	*Martes pennanti*				X	
Ermine	*Mustela erminea*		X	X	X	
Long-tailed weasel	*Mustela frenata*		X	X	X	
Mink	*Mustela vison*	Y	X	X	X	
Wolverine	*Gulo gulo*				X	
Badger	*Taxidea taxus*		X			
Western spotted skunk	*Spilogale gracilis*		X	X		
Striped skunk	*Mephitis mephitis*		X	X		
River otter	*Lutra canadensis*	Y	X	X	X	X
Mountain lion	*Felis concolor*			X	X	
Lynx	*Felis lynx*			X	X	
Bobcat	*Felis rufus*		X	X	X	
Elk	*Cervus elaphus*		X	X	X	
Black-tailed & mule deer	*Odocoileus hemionus*		X	X	X	

Table E-3. Birds using streamside riparian habitats on the Mt. Hood and/or Gifford Pinchot National forests. The riparian habitat types used by each species is indicated by an "X" in the appropriate column. Those species with a "Y" in the Riparian Species column are strongly tied to streamside riparian habitat - they are rarely found outside riparian areas.

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Common loon[1]	*Gavia immer*	Y				X
Pied-billed grebe[1]	*Podilymbus podiceps*	Y				X
Double-crested cormorant[1]	*Phalacrocorax auritus*	Y				X
Great blue heron	*Ardea herodias*	Y	X		X	X
Green-backed heron	*Butorides striatus*	Y	X	X	X	X
Canada goose	*Branta canadensis*	Y	X			X
Wood duck	*Aix sponsa*	Y			X	X
Green-winged teal[2]	*Anas crecca*	Y	X	X		X
Mallard[2]	*Anas platyrhynchos*	Y	X	X		X
Northern pintail[2]	*Anas acuta*	Y	X			X
Blue-winged teal[2]	*Anas discors*	Y	X	X		X
Cinnamon teal[2]	*Anas cyanoptera*	Y	X			X
Northern shoveler[2]	*Anas clypeata*	Y	X			X
Gadwall[2]	*Anas strepera*	Y	X	X		X
Redhead[1]	*Aythya americana*	Y				X
Ring-necked duck[1]	*Aythya collaris*	Y				X
Greater scaup[1]	*Aythya marila*	Y				X
Lesser scaup[1]	*Aythya affinis*	Y				X
Harlequin duck	*Histrionicus histrionicus*	Y			X	X
Common goldeneye[2]	*Bucephala clangula*	Y				X
Barrow's goldeneye[2]	*Bucephala islandica*	Y			X	X
Bufflehead[2]	*Bucephala albeola*	Y			X	X
Hooded merganser	*Lophodytes cucullatus*	Y			X	X
Common merganser	*Mergus merganser*	Y			X	X
Red-breasted merganser	*Mergus serrator*	Y			X	X
Ruddy duck[1]	*Oxyura jamaicensis*	Y				X
Turkey vulture	*Cathartes aura*		X	X	X	
Osprey	*Pandion haliaetus*	Y			X	X
Bald eagle	*Haliaeetus leucocephalus*	Y	X		X	X
Northern harrier[3]	*Circus cyaneus*		X			
Sharp-shinned hawk	*Accipiter striatus*				X	

Table E-3 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Cooper's hawk	*Accipiter cooperii*				X	
Northern goshawk	*Accipiter gentilis*				X	
Red-tailed hawk	*Buteo jamaicensis*		X	X	X	
Rough-legged hawk	*Buteo lagopus*		X			
American kestrel	*Falco sparverius*		X	X	X	
Merlin	*Falco columbarius*		X	X		
Peregrine falcon	*Falco peregrinus*		X	X	X	
Prairie falcon	*Falco mexicanus*		X			
Ring-necked pheasant	*Phasianus colchicus*		X	X		
Ruffed grouse	*Bonasa umbellus*		X	X	X	
California quail	*Callipepla californica*		X	X		
Mountain quail	*Oreortyx pictus*		X	X		
American coot	*Fulica americana*	Y	X			X
Killdeer	*Charadrius vociferus*	Y	X			
Greater yellowlegs[3]	*Tringa melanoleuca*	Y	X			X
Solitary sandpiper	*Tringa solitaria*	Y	X			
Spotted sandpiper	*Actitis macularia*	Y	X			
Common snipe[3]	*Gallinago gallinago*	Y	X	X		
Mew gull	*Larus canus*	Y			X	X
Ring-billed gull	*Larus delawarensis*	Y				X
California gull	*Larus californicus*	Y				X
Herring gull	*Larus argentatus*	Y				X
Glaucous-winged gull	*Larus glaucescens*	Y				X
Marbled murrelet	*Brachyramphus marmoratus*				X	
Rock dove	*Columba livia*		X	X		
Band-tailed pigeon	*Columba fasciata*			X	X	
Mourning dove	*Zenaida macroura*		X	X	X	
Barn owl	*Tyto alba*		X		X	
Western screech-owl	*Otus kennicottii*				X	
Great horned owl	*Bubo virginianus*		X	X	X	
Northern pygmy-owl	*Glaucidium gnoma*				X	
Northern spotted owl	*Strix occidentalis caurina*				X	
Barred owl	*Strix varia*				X	

Table E-3 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Great gray owl	*Strix nebulosa*		X	X	X	
Long-eared owl	*Asio otus*		X	X	X	
Short-eared owl[3]	*Asio flammeus*	Y	X			
Northern saw-whet owl	*Aegolius acadicus*		X	X	X	
Common nighthawk	*Chordeiles minor*		X	X	X	
Common poorwill	*Phalaenoptilus nuttallii*		X	X		
Black swift	*Cypseloides niger*		X	X	X	
Vaux's swift	*Chaetura vauxi*		X	X	X	
Anna's hummingbird	*Calypte anna*		X	X		
Calliope hummingbird	*Stellula calliope*		X	X		
Rufous hummingbird	*Selasphorus rufus*		X	X	X	
Belted kingfisher	*Ceryle alcyon*	Y		X	X	X
Lewis' woodpecker	*Melanerpes lewis*		X	X	X	
Red-naped sapsucker	*Sphyrapicus nuchalis*				X	
Red-breasted sapsucker	*Sphyrapicus ruber*				X	
Williamson's sapsucker	*Sphyrapicus thyroideus*				X	
Downy woodpecker	*Picoides pubescens*				X	
Hairy woodpecker	*Picoides villosus*				X	
Three-toed woodpecker	*Picoides tridactylus*				X	
Black-backed woodpecker	*Picoides arcticus*				X	
Northern flicker	*Colaptes auratus*				X	
Pileated woodpecker	*Dryocopus pileatus*				X	
Olive-sided flycatcher	*Contopus borealis*		X	X	X	
Western wood-pewee	*Contopus sordidulus*			X	X	
Willow flycatcher	*Empidonax traillii*	Y		X		
Hammond's flycatcher	*Empidonax hammondii*				X	
Pacific slope flycatcher	*Empidonax difficilis*				X	
Cordilleran flycatcher	*Empidonax occidentalis*				X	
Ash-throated flycatcher	*Myiarchus cinerascens*			X	X	
Western kingbird	*Tyrannus verticalis*		X	X		
Eastern kingbird	*Tyrannus tyrannus*		X	X		
Purple martin	*Progne subis*	Y	X	X	X	
Tree swallow	*Tachycineta bicolor*		X	X	X	

Table E-3 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Violet-green swallow	*Tachycineta thalassina*		X	X	X	
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Y	X	X		
Bank swallow	*Riparia riparia*	Y	X			
Cliff swallow	*Hirundo pyrrhonota*		X			
Barn swallow	*Hirundo rustica*		X	X		
Gray jay	*Perisoreus canadensis*				X	
Steller's jay	*Cyanocitta stelleri*				X	
Scrub jay	*Aphelocoma coerulescens*		X	X		
Black-billed magpie	*Pica pica*		X	X		
American crow	*Corvus brachyrhynchos*		X	X	X	
Common raven	*Corvus corax*		X	X	X	
Black-capped chickadee	*Parus atricapillus*			X	X	
Mountain chickadee	*Parus gambeli*			X	X	
Chestnut-backed chickadee	*Parus rufescens*				X	
Red-breasted nuthatch	*Sitta canadensis*				X	
White-breasted nuthatch	*Sitta carolinensis*				X	
Pygmy nuthatch	*Sitta pygmaea*				X	
Brown creeper	*Certhia americana*				X	
Bewick's wren	*Thryomanes bewickii*			X	X	
Olive-sided flycatcher	*Contopus borealis*		X	X	X	
Western wood-pewee	*Contopus sordidulus*			X	X	
Willow flycatcher	*Empidonax traillii*	Y		X		
Hammond's flycatcher	*Empidonax hammondii*				X	
Pacific slope flycatcher	*Empidonax difficilis*				X	
House wren	*Troglodytes aedon*			X	X	
Winter wren	*Troglodytes troglodytes*				X	
American dipper	*Cinclus mexicanus*	Y				X
Golden-crowned kinglet	*Regulus satrapa*				X	
Ruby-crowned kinglet	*Regulus calendula*			X	X	
Swainson's thrush	*Catharus ustulatus*			X	X	
Hermit thrush	*Catharus guttatus*			X	X	
American robin	*Turdus migratorius*		X	X	X	
Varied thrush	*Ixoreus naevius*				X	

Table E-3 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
American pipit (water pipit)	*Anthus spinoletta*		X			
Bohemian waxwing	*Bombycilla garrulus*			X	X	
Cedar waxwing	*Bombycilla cedrorum*			X	X	
Northern shrike	*Lanius excubitor*			X		
Loggerhead shrike	*Lanius ludovicianus*			X		
European starling	*Sturnus vulgaris*		X	X	X	
Solitary vireo	*Vireo solitarius*				X	
Hutton's vireo	*Vireo huttoni*			X	X	
Warbling vireo	*Vireo gilvus*			X	X	
Red-eyed vireo	*Vireo olivaceus*			X	X	
Orange-crowned warbler	*Vermivora celata*			X		
Nashville warbler	*Vermivora ruficapilla*			X	X	
Yellow warbler	*Dendroica petechia*			X		
Yellow-rumped warbler	*Dendroica coronata*			X	X	
Black-throated gray warbler	*Dendroica nigrescens*			X	X	
Townsend's warbler	*Dendroica townsendi*				X	
Hermit warbler	*Dendroica occidentalis*				X	
American redstart	*Setophaga ruticilla*		X			
Macgillivray's warbler	*Oporornis tolmiei*			X		
Common yellowthroat	*Geothlypis trichas*	Y		X		
Wilson's warbler	*Wilsonia pusilla*			X	X	
Yellow-breasted chat	*Icteria virens*	Y		X		
Western tanager	*Piranga ludoviciana*			X	X	
Black-headed grosbeak	*Pheucticus melanocephalus*			X	X	
Lazuli bunting	*Passerina amoena*			X		
Rufous-sided towhee	*Pipilo erythrophthalmus*			X	X	
Chipping sparrow	*Spizella passerina*		X	X	X	
Savannah sparrow	*Passerculus sandwichensis*		X			
Fox sparrow	*Passerella iliaca*			X		
Song sparrow	*Melospiza melodia*		X	X		
Lincoln's sparrow	*Melospiza lincolnii*		X			
Golden-crowned sparrow	*Zonotrichia atricapilla*		X	X		
White-crowned sparrow	*Zonotrichia leucophrys*		X	X		

Table E-3 (con't).

			HABITAT TYPES USED			
Common Name	Scientific Name	Riparian Species	Grass/forb	Shrub	Forested	Aquatic
Dark-eyed junco	*Junco hyemalis*		X	X	X	
Snow bunting	*Plectrophenax nivalis*		X			
Red-winged blackbird	*Agelaius phoeniceus*	Y	X	X		
Western meadowlark	*Sturnella neglecta*		X			
Brewer's blackbird	*Euphagus cyanocephalus*		X	X		
Brown-headed cowbird	*Molothrus ater*		X	X	X	
Northern oriole	*Icterus galbula*				X	
Pine grosbeak	*Pinicola enucleator*			X	X	
Purple finch	*Carpodacus purpureus*				X	
Cassin's finch	*Carpodacus cassinii*		X	X	X	
House finch	*Carpodacus mexicanus*		X		XX	
Red crossbill	*Loxia curvirostra*				X	
Pine siskin	*Carduelis pinus*		X	X	X	
American goldfinch	*Carduelis tristis*		X	X		
Evening grosbeak	*Coccothraustes vespertinus*			X	X	
House sparrow	*Passer domesticus*		X	X		

[1] These species normally use aquatic portions of lakes but may rarely be found on slow-moving, deeper rivers.
[2] These species use slow-moving rivers and larger streams but are more likely to be found on lakes or ponds.
[3] These species are primrily wetland species but occasionally can be found in streamside riparian habitat.